

Fluids and Combustion Facility (FCF) Combustion Integrated Rack (CIR) Hardware Interface Control Document

International Space Station Program

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INTERNATIONAL SPACE STATION PROGRAM

FLUIDS AND COMBUSTION FACILITY (FCF) COMBUSTION INTEGRATED RACK (CIR) HARDWARE INTERFACE CONTROL DOCUMENT

PREFACE

This Interface Control Document (ICD) is the exclusive document used jointly by the National Aeronautics and Space Administration (NASA), and the Fluids and Combustion Facility (FCF) Combustion Integrated Rack (CIR) payload developer to identify and establish the pressurized payload physical/functional interfaces. This document contains the design implementation of the interface requirements in SSP 57000, Pressurized Payloads Interface Requirements Document (IRD). Both sides of the interface are described and include mechanical, structural, electrical, avionic, and functional interfaces. The interfaces outlined in this document are mandatory and may not be violated unless specifically agreed upon by the Payloads Control Board (PCB). This document is under the control of the Payloads Control Board, and changes or revisions will be approved by the PCB.

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INTERNATIONAL SPACE STATION PROGRAM

**FLUIDS AND COMBUSTION FACILITY (FCF) COMBUSTION INTEGRATED RACK (CIR)
HARDWARE INTERFACE CONTROL DOCUMENT**

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HARDWARE INTERFACE CONTROL DOCUMENT**

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FLUIDS AND COMBUSTION FACILITY (FCF) COMBUSTION INTEGRATED RACK (CIR) HARDWARE INTERFACE CONTROL DOCUMENT

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| | | 57217-NA-0013 | Paragraph(s) 3.5.1.2, 3.3.2.2 Table(s) 3.3.2.1-1, 3.3.3.2-1 |
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1.0 INTRODUCTION

1.1 PURPOSE

This ICD is the primary source of design implementation and module specific interfaces of the Pressurized Payload Interface Requirements Document. This Hardware ICD controls the International Space Station (ISS) FCF CIR interfaces for integration into the United States Laboratory (USL) and the Multi-Purpose Logistics Module (MPLM). The physical, functional, and environmental design implementation associated with payload safety and interface compatibility are included herein.

1.2 SCOPE

The interfaces defined in this document apply to transportation and on-orbit phases of the payload mission cycle for the FCF CIR. Transportation interfaces are specific to the MPLM. The reader is referred to SSP 52000-IDD-ERP, EXPRESS Rack Payloads Interface Definition Document, for requirements related to transportation in the Shuttle Middeck area.

1.3 USE

Section 3 of this document contains the CIR design implementation and module specific interface information while Section 4 has an applicability/verification matrix that provides traceability back to the specific interface design requirements applicable to the CIR contained in SSP 57000. The specific verification methods for each IRD interface design requirement are also documented in the applicability/verification matrix. The FCF project will be responsible for providing the specific CIR interface information in Section 3 for each applicable interface as well as identifying all applicable IRD requirements for that interface in the applicability matrix contained in Section 4. In addition, Section 5 contains a table that CIR Project will utilize to document exceptions to the applicable requirements in SSP 57000 or the module specific interfaces defined in SSP 57001. The FCF project will be responsible for providing any analysis or documentation required to evaluate and disposition identified exceptions to the IRD. Figure 1.3-1, Payload Interface Requirements and Control Process, shows the inter-relationship of the IRD, ICD Template, and the FCF CIR Hardware ICD.

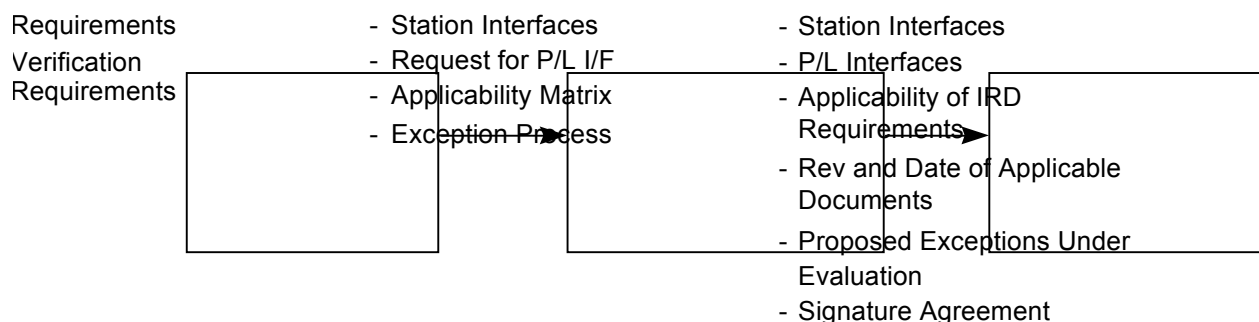


FIGURE 1.3-1 PAYLOAD INTERFACE REQUIREMENTS AND CONTROL PROCESS

1.4 PAYLOAD OVERVIEW

The FCF is a modular, multi-user facility designed to accommodate fluids and combustion experiments on board the USL Module of the ISS. The primary mission of FCF is to support accomplishment of NASA John H. Glenn Research Center (GRC)/Microgravity Sciences Division (MSD) Program objectives requiring sustained, systematic microgravity fluid physics and microgravity combustion science research on board the ISS. The extended duration microgravity environment of the ISS will enable microgravity research to enter into a new era of increased scientific and technological data return. The FCF is being designed to increase the amount and quality of scientific and technological data, while decreasing the development cost of individual experiments relative to other avenues of performing such experiments.

The FCF will occupy two International Standard Payload Racks (ISPR) to provide the common on-orbit infrastructure needed by the fluids and combustion disciplines and on-orbit accommodations for the experiment-specific hardware needed by individual fluids and combustion scientists.

The initial deployment of FCF will be the launch of the CIR, which will function independently as a single integrated rack allowing for early science research opportunities while accommodating ISS launch manifests and resource availability. The final deployment of the FCF will occur with the launch of the Fluids Integrated Rack (FIR), which will also function independently as a single integrated rack. Once the two racks are completely installed on-orbit, approved upgrades will be performed to offer enhanced capabilities to meet the full set of facility science requirements.

1.4.1 GENERAL PAYLOAD DESCRIPTION

1.4.1.1 SCIENCE CAPABILITY

The ISS FCF is a multidiscipline research facility that provides accommodations to investigate combustion and fluids phenomenon in a sustained microgravity environment. Investigations performed in a microgravity environment provide unique insight into the behavior of fluids and combustion science. The combustion portion of the FCF supports investigation and observation of laminar flames, turbulent combustion, droplet and spray combustion, and other types of combustion research. The fluids portion of the FCF supports investigation and observation of multiphase flows, boiling, condensation, colloid physics, surface tension controlled flows, and other types of fluid physics research.

Hardware developed for a Principal Investigator (PI) is the key to FCF adaptability. Experiment-specific components are individually engineered for each new experiment (or group of experiments). These unique components customize FCF to perform experiments in the most effective way.

The FCF is being developed to allow for a three-tier approach to performing science experiments. Tier 1 is the common platform providing the basic infrastructure for all FCF experiments. This platform includes all the services required by the experiments, such as power and thermal control as well as data acquisition and control. Tier 2 is a multi-user insert that can be used for multiple experiments of sufficient commonality. The inserts can be designed for a specific sub-discipline and used several times with minimal modifications between experiments. Tier 3 has the PI-unique equipment that must be built and launched for each experiment. This equipment will include special diagnostics or avionics, as well as test samples or consumables. However, once on orbit, that equipment may be reused or added to the capability of FCF or the multi-use inserts.

To meet the FCF requirement of conducting at least 10 typical PI experiments per year, FCF is designed to reduce PI hardware mass and cost. This design is feasible because FCF keeps commonly used hardware permanently on orbit (e.g., cameras, computers, actuators, combustion chamber, optical fixtures, light sources) and has permanent ground facilities for use by any PI. PIs provide only those items which are unique to their experiment.

1.4.1.2 FLIGHT SEGMENT

The Flight Segment includes the CIR and FIR racks which will be installed in the USL. These racks will provide the resources needed for PIs to conduct the actual flight experiments in microgravity conditions. In addition to providing specific hardware and resources for combustion science experiments in the CIR and fluids science experiments in the FIR, the two FCF racks incorporate the shared functions listed below:

- Power control and distribution equipment
- Environmental controls including air and water cooling and fire detection and suppression

- Command, data management, image processing, and communication hardware and software

The FCF utilizes design commonality across the two racks in the following subsystems:

- Structure
 - Rack Door
 - Optics Bench Attachment Hardware
 - Optics Bench Slides and Pins
- Electrical
 - Electrical Power Control Unit (EPCU)
- Command and Data Management
 - Diagnostic Control Module (DCM)
 - Input/Output Processor (IOP)
 - Common Image Processing and Storage Units (IPSU)
- Environmental Control System (ECS)
 - Air Thermal Control Unit (ATCU)
 - Water Thermal Control System (WTCS)
 - Fire Detection and Suppression System (FDSS)
 - Gas Interface System (GIS)
- Space Acceleration Measurement System (SAMS) Triaxial Sensor Head (TSH)

The CIR, the first FCF element to be launched, provides sustained combustion physics research in the microgravity environment of the ISS. Investigators use this microgravity environment to isolate and control gravity-related phenomena and to investigate processes that are normally masked by gravity effects and thus are difficult to study on Earth. Combustion microgravity experiments can provide a unique insight into the control of the generation of combustion by-products (pollution) and the increased efficiency of fuels.

The CIR System has the following unique subsystems determined to be essential to fulfill the requirements resulting from the initial complement of microgravity combustion physics experiments:

- Combustion Chamber
- Fuel Oxidizer and Management Assembly (FOMA)
 - Gas Distribution
 - Exhaust Vent
 - Gas Chromatograph Package
- FOMA Control Unit (FCU)

- Optics Bench Assembly
- CIR-Specific Diagnostic Packages
 - High Frame Rate/High Resolution (HFR/HR) Package
 - Illumination Package
 - Low Light Level Ultraviolet (LLL-UV) Package
 - Low Light Level Infrared (LLL-IR) Package
 - High Bit Depth/Multi-Spectral (HiBMS) Package
- Passive Rack Isolation System (PaRIS) (standard configuration)

The PI will provide any additional hardware required to satisfy unique research requirements, including:

- Chamber Insert Assembly (i.e., Multi-User Droplet Combustion Apparatus (MDCA))
- Avionics Box
- Diagnostic Equipment

Figure 1.4.1.2-1, Combustion Integrated Rack Subsystems, identifies components located in the CIR.

Figure 1.4.1.2-2 shows a PaRIS equipped ISPR.

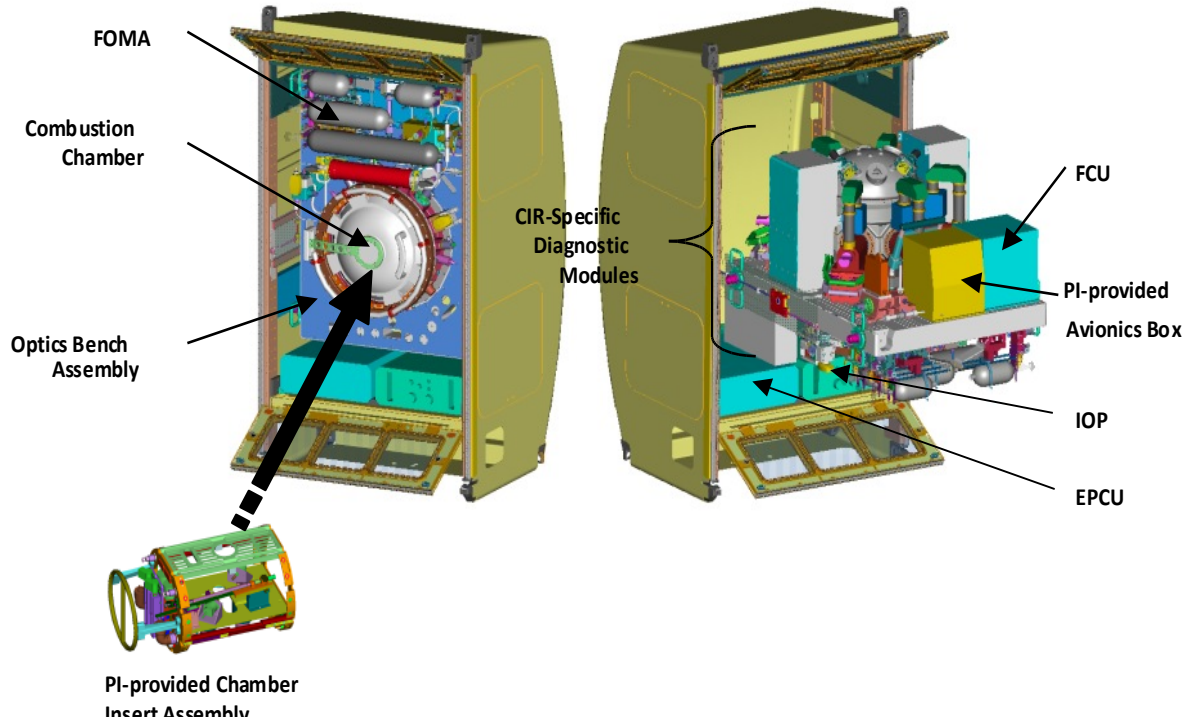
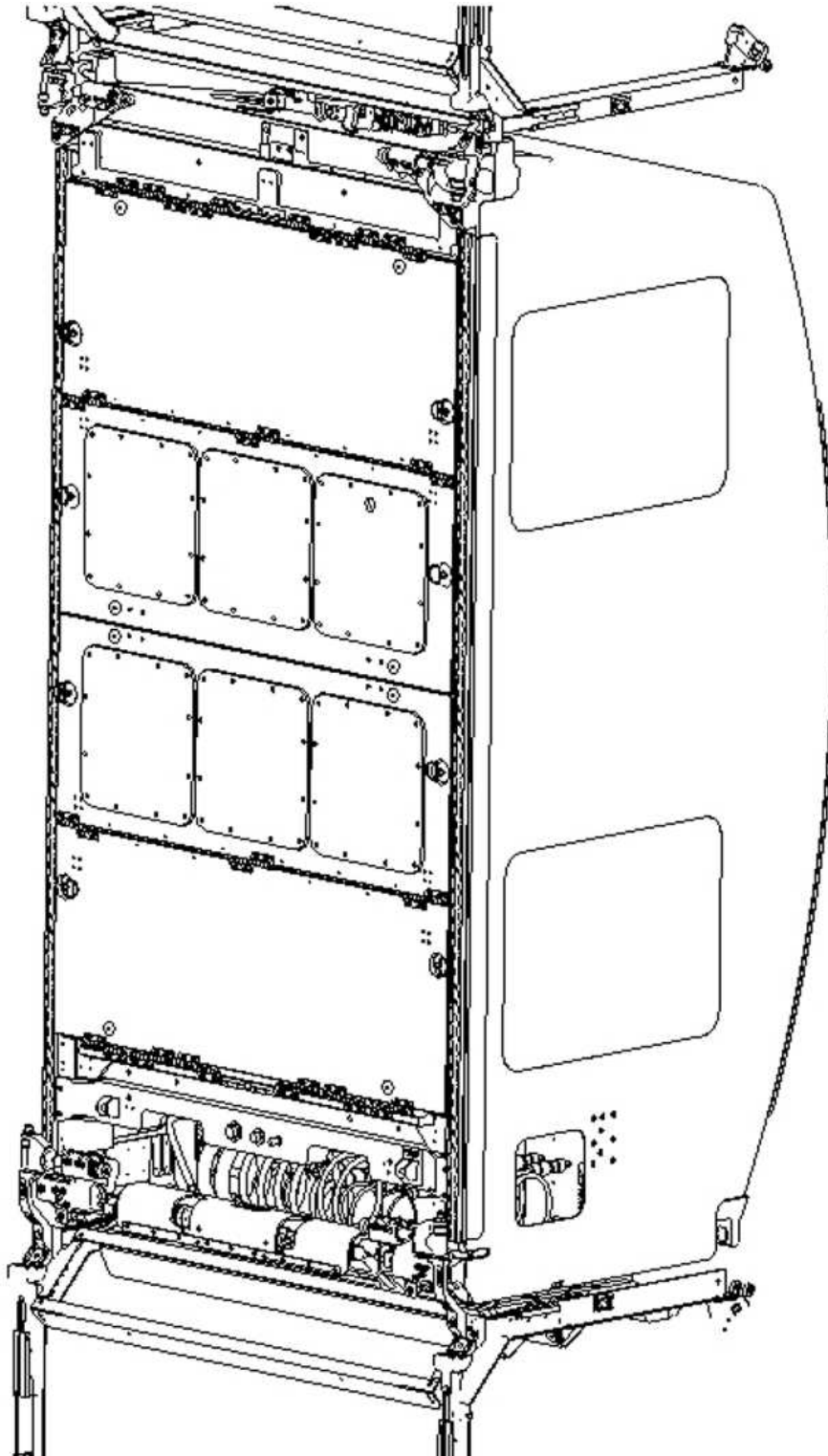
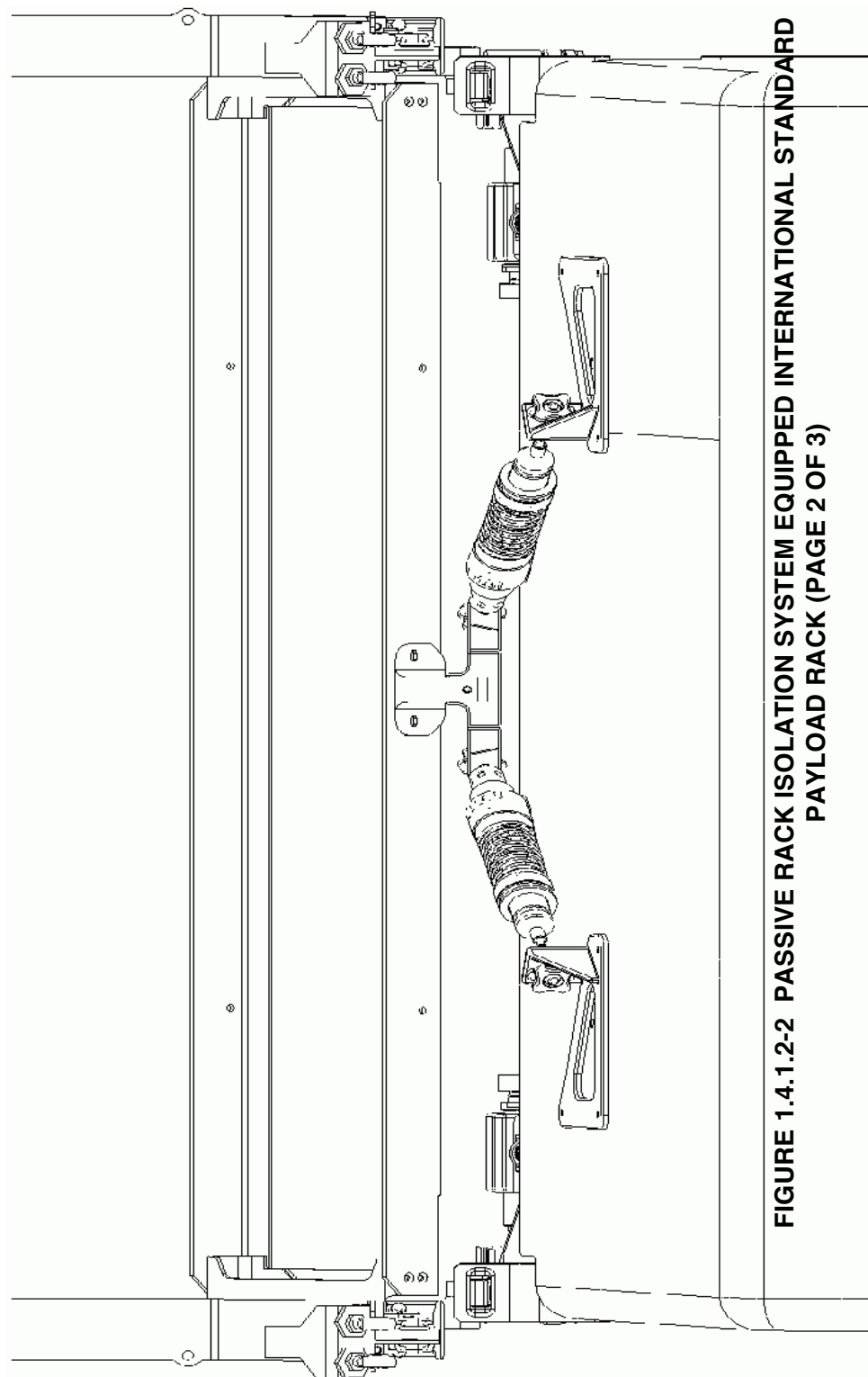


FIGURE 1.4.1.2-1 COMBUSTION INTEGRATED RACK SUBSYSTEMS



**FIGURE 1.4.1.2-2 PASSIVE RACK ISOLATION SYSTEM EQUIPPED INTERNATIONAL
STANDARD PAYLOAD RACK (PAGE 1 OF 3)**



Note: View is from the upper back side of the rack.

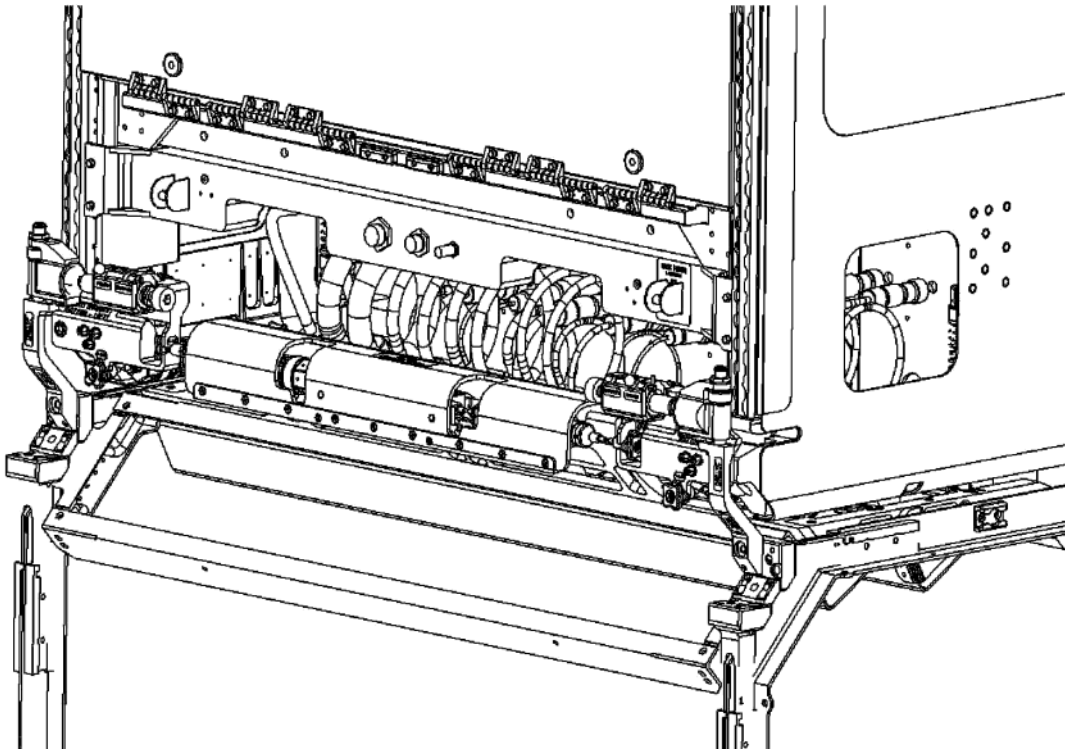


FIGURE 1.4.1.2-2 PASSIVE RACK ISOLATION SYSTEM EQUIPPED INTERNATIONAL STANDARD PAYLOAD RACK (PAGE 3 OF 3)

1.4.2 PAYLOAD OPERATIONS

The FCF is operated by both the crew and ground operations personnel. The crew sets up and prepares the FCF payloads for semi-automated operations. Experiment setup involves installation of PI-unique hardware and samples and reconfiguration of the diagnostics. The crew also performs maintenance and upgrades to the facility. Once the FCF racks are on orbit, crewmembers will perform all physical operations related to installation, configuration, and maintenance of the rack and PI hardware. The ground team will remotely conduct most of the experiment operations after physical operations performed by the crew.

1.4.2.1 ON-ORBIT OPERATIONS

Upon initial arrival of CIR on orbit, the crew will transfer the rack from the MPLM into the USL module of the ISS. Using the installation and setup procedures, the crew will install the rack in the USL module and install PaRIS. The crew will then populate the rack with additional hardware that was not installed in the rack for launch, such as diagnostics, consumables, and any PI-unique hardware as needed to carry out the science of a specific PI. For CIR, this will include installing or reconfiguring a PI-provided Chamber Insert Assembly (CIA), which is mounted into the combustion chamber, rotating the optics bench and mounting the PI-provided avionics box and diagnostic packages to the optics bench, and installing gas bottles and a filter cartridge on the front of the optics bench.

With the hardware installed and the rack doors closed, the CIR is prepared for on-orbit checkout. The CIR will be verified for operations by a series of tests and calibrations controlled by either ground command, crew action, automated sequence, or a combination thereof. After on-orbit checkout is complete and any necessary adjustments or changes are made to the system, the CIR is ready to be used for science operations.

The experiment will typically be run with pre-programmed routines and commands from the ground teams. A run includes setup, science event, data collection, and reconfiguration. The typical combustion run will take from 8 hours up to 12 hours. In between combustion events, the CIR exhaust vent package will process the atmosphere in the chamber and either return the gas to the chamber or vent the gas through the ISS Vacuum Exhaust System (VES)/Waste Gas System (WGS). The CIR also has the capability to exhaust gases during the experiment.

A microgravity environment is required during the experiment operation period. During the normal operating period, the ISS crew will have minimal involvement in the actual execution of an experiment. Operations of the experiment will be primarily conducted from the GRC Telescience Support Center (TSC). Remote PI sites will be provided with the necessary command and control media to manage and monitor the experiment executions. The ISS crew, however, will have the ability to communicate and control the experiments using the Station Support Computer (SSC) with the help of the ground operation team. When an experiment run is complete, the rack will be safed and powered down, possibly requiring crew involvement.

From the TSC and remote sites, the PI will work with the FCF operations team during experiment operations. Based on the short-term plan, the FCF operations team will coordinate the initial power up of the facility with the Payload Operations and Integration Center (POIC) and the ISS crew. Once the facility rack is powered and checkout is completed, the FCF and PI operations teams will uplink the desired commands for the experiment. As the experiment proceeds, the FCF and PI operations teams will monitor the downlinked video and data to ensure that the experiment is proceeding as planned. If problems are encountered, the teams will work together with the POIC and crew to resolve them. At the end of a day, upon completion of a series of test points, or completion of an experiment, the FCF operations team will uplink commands to terminate the experiment and power down the rack. The FCF operations team will coordinate with the POIC cadre any crew action needed in the shutdown or completion of an experiment or test point. When the experiment is complete, the experiment hardware will be removed from the facility and put into the stowage lockers to be returned on a following logistics flight.

The ISS crew will be responsible for all regular and unscheduled maintenance activities. On-orbit maintenance of the CIR will center on the removal and installation of Orbital Replacement Units (ORUs). Maintenance activities also include cleaning and calibration to ensure proper system operation during scientific experiments. The preferred time for these activities will be during non-microgravity days or other downtime when the CIR is not scheduled to be utilized, which allows maximum availability of the CIR for science during available microgravity periods.

1.4.2.2 GROUND OPERATIONS

The FCF ground operations consist of all the ground activities required to support the on-orbit operations, including coordination of on-orbit procedure execution, real-time procedure generation, command generation and uplink, communication with the POIC cadre and ISS crew, engineering and science data monitoring and analysis.

The FCF operations team, in conjunction with the PI team, will support the performance of procedures required for the installation, checkout, and nominal operations of the CIR. This support will be accomplished by monitoring air-to-ground communication and downlink video of crew activities and working with the POIC to provide technical support to the task.

Real-time procedure generation takes place when an off-nominal operation needs to be done by the crew and no procedure has been developed. In this case the FCF ground operations team will consult with the engineering team and the POIC to develop the required procedure using the FCF Ground Integration Unit (GIU) as the development platform.

The FCF operations team will generate all commands needed to operate the CIR and coordinate with the POIC for uplink. Alternatively, the FCF operations team may provide the command via voice communication to the crew instructing them to issue commands via the SSC. The FCF Ground Segment, in combination with the TSC, will have the necessary tools to generate the commands and to update the command database as required.

The most important ground operation will be providing console support during real-time usage of the CIR, monitoring the facility engineering and science data, which will be accomplished using the TSC as well as FCF-provided tools. The FCF operations team will monitor the engineering data to track the health of the facility. They will also insure that the PI teams are receiving their desired science data. All data will be stored for later analysis and distribution.

Mission planning during an increment will consist of updating the current Short-Term Plan (STP) and Onboard Operations Summary (OOS) by submitting planning requests through either the Payload Information Management System (PIMS) or the Payload Planning system. The ground team will also participate in the daily science tag with the Lead Increment Scientist (LIS) and/or LIS representative to establish the execution priorities not captured in the STP or OOS. All interactions with the POIC will be by video loop/teleconference. Planning requests will be submitted through the PIMS.

2.0 DOCUMENTATION

The following documents shown include specifications, models, standards, guidelines, handbooks, and other special publications. Specific date and revision number of documents under control of the space Station Control Board can be found in SSP 50257, Program Control Document Index or SSP 50258, Prime Control Document Index. The documents in this section are inclusive to those specified in this document and form a part of this specification to the extent specified herein. In the event of a conflict between the documents referenced and the contents of this ICD, the content of this ICD must be considered a superseding requirement.

2.1 APPLICABLE DOCUMENTS

2.1.1 CITED APPLICABLE DOCUMENTS

| DOCUMENT NO. | TITLE |
|--|---|
| 220G07455 Rev. D, July 26, 1996 | Upper Structure Assembly Drawing |
| 220G07475 Rev. C, April 22, 1996 | SSPF Base Assembly Drawing |
| 220G07500 Rev. A, July 10, 1995 | Shipping Container, Integrated Assembly Drawing |
| 683-50243 Rev. H, Mar. 30, 2000 | Rack Equipment, U.S. Standard-Assy |
| MIL-STD-1553 Rev. B, Jan. 31, 1993 | Digital Time Division Command/Response Multiplex Data Bus |
| NSTS 21000-IDD-MDK Rev. B, Aug. 15, 1996 IRN 17, Aug. 5, 1997 IRN 18, Nov. 13, 1997 IRN 19, Jan. 1, 2000 IRN 20, Jan. 1, 2000 IRN 21, Jan. 1, 2000 | Middeck Payloads Interface Definition Document for Middeck Accommodations |
| SSP 30482 (V1) Rev. C, July 7, 1997 | Electric Power Specifications and Standards, Vol. 1: EPS Performance Specifications |
| SSP 30573 Rev. B, Mar. 1, 1998 | Space Station Program Fluid Procurement and Use Control Specification |
| SSP 41017, Part 1 Rev. F, May 18, 2001 | Rack to Mini Pressurized Logistics Module Interface Control Document (ICD), Part 1 |
| SSP 41017, Part 2 Rev. H, May 18, 2001 | Rack to Mini Pressurized Logistics Module Interface Control Document (ICD), Part 2 |

| DOCUMENT NO. | TITLE |
|---|---|
| SSP 50251, Part I, Rev. B May 30, 2003 | ARIS to Pressurized Element Interface Control Document |
| SSP 50251, Part II Rev. B May 30, 2003 PIRN 50251-ES-2002A, December 23, 2003 | ARIS to Pressurized Element Interface Control Document |
| SSP 50467 Draft, March, 1997 | ISS Stowage Accommodation Hardbook |
| SSP 57000 Rev. G, Sept. 4, 2003 | Pressurized Payload Interface Requirements Document |
| SSP 57001 Rev. D, May 6, 2003 | Pressurized Payload Hardware Interface Control Document Template |
| SSQ 21635 Rev. H, Aug. 1, 1997 DCN 001, 011, 012, 013, 014, 015, 016 | Connectors and Accessories, Electrical, Rectangular, Rack and Panel |
| SSQ 22678 Rev. G, Feb. 4, 2002 | Space Station Program Office Microcircuit Hybrid, MIL-STD- 1553, Terminal Interface and Transceiver Space Quality Specification |

2.2 REFERENCE DOCUMENTS

| DOCUMENT NO. | TITLE |
|--|--|
| 220G07470 Rev. B, Mar. 30, 1995 | MSFC Base Assembly Drawing |
| 683-10007 Rev. L, Mar. 21, 1997 ADCN H12, H13, H14, H15, H16, H17 | Fire Detection Assembly |
| 683-16348 Rev. G, Jan. 1, 1998 | Coupling, Quick Disconnects, Fluid, Self-sealing, Internal Envelope Drawing |
| 683-17103 Rev. A, Oct. 20, 1994 | Fluid System Servicer (FSS) Interface Definition Drawings |
| CCSDS 701.0-B-2 Issue 2, Nov. 1992 | Advanced Orbiting Systems, Network and Data Links: Architectural Specification, Blue Book |

| DOCUMENT NO. | TITLE |
|---|---|
| D684-10056-01 Rev. H, Oct. 5, 1998 DCN 004, 002, 003, 005-103 | International Space Station Program, Prime Contractor Software Standards and Procedures Specification |
| EIA-RS-170 Rev. A, Nov. 1997 | Electrical Performance Standards for Television Studio Facilities |
| EIA/TIA 250 Rev. E, July 1991 | Electrical Performance for Television Relay Facility |
| FED-STD-595 Rev. B, Dec. 15, 1989 | Colors Used in Government Procurement |
| ICD-A-21378 | SSP DEAP to ISSP HAS/CHEK GSE Interfaces |
| ICD-A-21379 | ISS Payload/GSE Ground Operations Envelope ICD |
| IEEE 802.3 | Institute of Electrical and Electronic Engineers 802.3 (Ethernet) Standard |
| ISO/IEC 8802-3 4th Edition, July 1993 | Carrier Sense Multiple Access With Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications |
| JSC 27199 Rev. A, Mar. 1997 | End Item Specification for the International Space Station Portable Utility Light |
| JSC 27260 Rev. B, Sept. 1997 | Decal Process Document and Catalog |
| MA2-95-048 Sept. 26, 1995 | Thermal Limits for Intravehicular Activity |
| MIL-STD-1686 Rev. B, Dec. 31, 1992 | Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) Document |
| MSFC-SPEC-250 Rev. A, Oct. 1, 1977 | Protective Finishes for Space Vehicle Structures and Associated Flight Equipment, General Specification for Document |
| MSFC-STD-275 Nov. 1, 1963 | Marking of Electrical Ground Support Equipment, Front Panels and Rack Title Plates |
| MSFC-STD-531 Sept. 1978 | High Voltage Design Criteria |
| NASA TM 102179 June 1, 1991 | Selection of Wires and Circuit Protective Devices for STS Orbiter Vehicle Payload Electrical Circuits |

| DOCUMENT NO. | TITLE |
|---|--|
| NSTS 1700.7B Jan. 13, 1989 CN 1, Feb. 24, 1998 CN 2, Jan. 20, 1994 CN 3, Dec. 8, 1995 CN 4, Mar. 21, 1997 CN 5, Oct. 12, 1998 CN 6, Jul. 28, 1999 CN 7, Jul. 29, 2000 CN 8, Aug. 22, 2000 CN 9, Jan. 29, 2001 CN 10, Mar. 12, 2001 CN 11, May 11, 2001 CN 12, Sept. 26, 2002 | Safety Policy and Requirements for Payloads Using the Space Transportation System |
| NSTS 18798 Rev. B, Sep., 1999 CN 7, Oct., 2000 | Interpretations of NSTS/ISS Payload Safety Requirements |
| NTC Report No. 7 Jan. 1976 | Video Facility Testing Technical Performance Objectives (NTC) |
| SN-C-0005 Rev. C, Feb. 15, 1989 | NSTS Contamination Control Requirements Manual |
| SSP 30233 Rev. E, Nov. 21, 1995 | Space Station Requirements for Material and Processes |
| SSP 30237 Rev. C, June 6, 1996 | Space Station Requirements for Electromagnetic Emission and Susceptibility Requirements |
| SSP 30240 Rev. C, June 15, 1999 DCN 002 | Space Station Grounding Requirements |
| SSP 30242 Rev. E, Aug. 25, 1999 | Space Station Cable/Wire Design and Control Requirements for Electromagnetic Compatibility |
| SSP 30243 Rev. E, July 29, 1998 DCN 003, 004, 005 | Space Station Requirements for Electromagnetic Compatibility |

| DOCUMENT NO. | TITLE |
|--|---|
| SSP 30245 Rev. E, Nov. 23, 1999 | Space Station Electrical Bonding Requirements |
| SSP 30257:004 Rev. E, Nov. 22, 1996 | Space Station Program Intravehicular Activity Restraints and Mobility Aids Standard ICD |
| SSP 30262:013 Rev. G, April 1, 1998 | Smoke Detector Assembly Standard ICD |
| SSP 30426 Rev. D, May 13, 1994 DCN 001 | External Contamination Control Requirements |
| SSP 30512 Rev. C, Jun. 3, 1994 | Ionizing Radiation Design Environment |
| SSP 41002 Rev. I, Mar. 31, 1999 | International Standard Payload Rack to NASA/NASDA Modules Interface Control Document |
| SSP 50005 Rev. B, Nov. 21, 1995 | International Space Station Flight Crew Integration Standard (NASA-STD-3000/T) Document |
| SSP 50053 Rev. A, Jan. 1999 | ASI Flight Hardware to Launch and Landing Site Interface Control Document |
| SSP 50184 Rev. A, Aug. 15, 1997 | High Rate Data Link Physical Media, Physical Signaling & Protocol Specifications |
| SSP 50257 Rev. L, June 15, 2000 | Program Control Document Index |
| SSP 50258 Rev. L, June 15, 2000 | Prime Control Document Index |
| SSP 50313 Rev. B, Jan. 24, 2004 | Display and Graphical Commonality Standard |
| SSP 52005 Rev. C, Dec. 18, 2002 | ISS Payload Flight Equipment and Guidelines For Safety Critical Structures |
| SSP 52050 Rev. A, Sept. 25, 1998 | Software Interface Control Document, Part 1, International Standard Payload Rack to International Space Station |
| SSP 57002 Rev. A, Aug. 7, 2000 | Payload Software Interface Control Document Template |
| SSP 57020 | Pressurized Payload Accommodation Handbook |
| SSQ 21635 Rev. J, Jan. 15, 2000 | Connectors and Accessories, Electrical, Circular, Miniature, IVA/EVA Compatible, Space Quality, General Specification for |

| DOCUMENT NO. | TITLE |
|------------------------------------|--|
| SSQ 21654 Rev. C, Sept. 8, 1998 | Cable, Single Fiber, Multitude, Space Quality, General Specification for Document |
| SSQ 21655 Rev. E, July 15, 1998 | Cable, Electrical, MIL-STD-1553 DataBus, Space Quality, General |

2.3 UNIQUE APPLICABLE DOCUMENTS

Rack integrators will be developing their integrated racks to the current version of SSP 57000 and the Pressurized Payload IRD applicable documents that correspond to requirements marked as applicable in the Chapter 4 Applicability Matrix of their unique ICD. This matrix provides the traceability back to the applicable IRD requirement and hence the corresponding verification requirement. Rack integrators will be responsible for impacting any changes processed as ISS Payload Office Preliminary/Proposed Interface Revision Notices (PIRNs) to these applicable documents and report to the ISS Program Office as to whether the changes impact them. Changes that impact integrated rack development will be handled with either a waiver or design change that is approved by the ISS Program Office.

- * When CIR rack mass is at its on-orbit allowable at 1,100 kg, and handled in the RSC at this mass (with constraints), a RSC labeling exception is applicable. Refer to 57227-NA-0008.

Revision C**3.0 PAYLOAD INTERFACE****3.1 STRUCTURAL/MECHANICAL****3.1.1 RACK ATTACHMENT INTERFACES****3.1.1.1 GSE INTERFACES**

- A. The Kennedy Space Center (KSC) Rack Insertion Device (RID) attaches to the Ground Support Equipment (GSE) interfaces on the front of the CIR as defined in SSP 41017 Part 2, Rack to Mini Pressurized Logistics Module Interface Control Document, Part 2, paragraph 3.3.3, Ground Handling Attachment Interfaces, and will accommodate only the payload protrusions identified in SSP 41017 Part 1, Rack to Mini Pressurized Logistics Module Interface Control Document, Part 1, paragraph 3.2.1.1.2 Static Envelope. It also pivots the CIR to install it into the Multi-Purpose Logistics Module (MPLM). The pivot keepout envelope is also identified in SSP 41017 Part 1, paragraph 3.2.1.1.2 Static Envelope. RID Ground handling loads for GSE points E, F, G, H are identified in SSP 41017 Part 1, paragraph 3.2.1.4.3 Interface Loads, and are much less than the launch and landing loads for points A, B, C, and D. The NASA 683-50243-4 ISPR and the Japan Aerospace Exploration Agency (JAXA) ISPR meet the interfaces defined above.

CIR protrusions which affect ground processing are illustrated in Figure 3.1.1.1-1, Combustion Integrated Rack Ground Operations Rack Protrusions. The CIR is PaRIS equipped and will utilize a removable umbilical design. The CIR umbilicals will launch in a stowage location and be attached on-orbit. The CIR will utilize the 683-50243-4 ISPR.

- B. All integrated racks may be shipped in an ISS-provided Rack Shipping Container (RSC).* The CIR interfaces to the RSC per Teledyne Brown Engineering (TBE) drawing 220G07500, Shipping Container Integrated Assembly. The RSC accommodates the static envelope of the ISPR identified in SSP 41017 Part 1, paragraph 3.2.1.1.2 Static Envelope.

The CIR will utilize an ISS-provided RSC for shipping and will stay within the ISPR static envelope for shipment.



**This condition represents an exception to requirements found in SSP 57000, paragraph 3.1.1.4.A. Refer to 57217-NA-0005C. Table 5.2.2-1 provides the status of all exceptions.

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- C. All NASA ISPRs are integrated in a Rack Handling Adapter (RHA). JAXA Racks may be integrated in a JAXA Rack Stand. The KSC Payload Test and Checkout System (PTCS) will only accommodate an integrated rack in an ISS RHA with Space Station Processing Facility (SSPF) Base. The CIR interfaces with RHA part number 220G07455-002 per TBE drawings 220G07455, Upper Structure Assembly; and 220G07475, SSPF Base Assembly.** The RHA accommodates the static envelope of the ISPR identified in SSP 41017 Part 1, paragraph 3.2.1.1.2 Static Envelope.

The CIR will be integrated in an ISS-provided RHA for rack handling and integration.



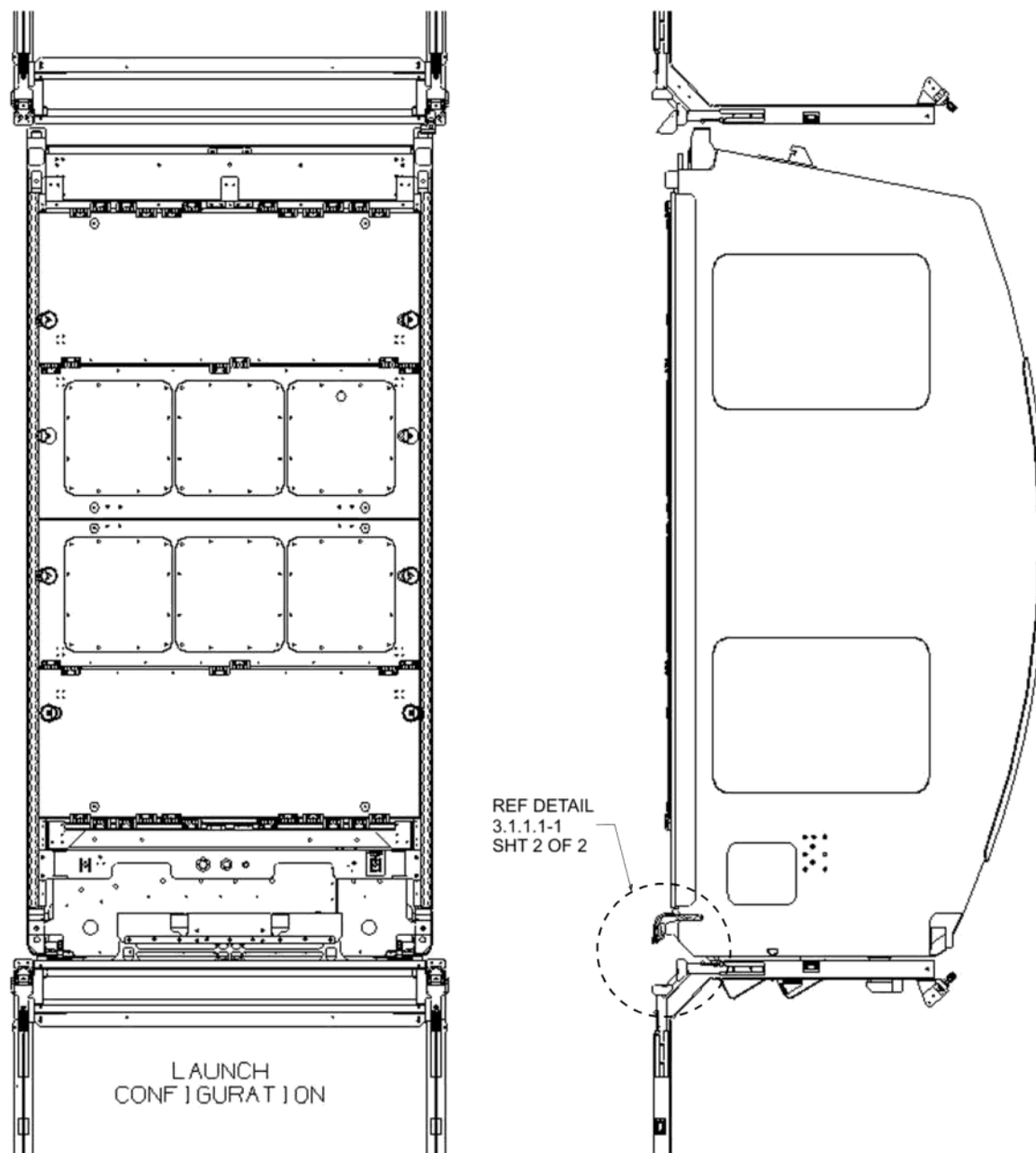


FIGURE 3.1.1.1-1 COMBUSTION INTEGRATED RACK GROUND OPERATIONS RACK PROTRUSIONS (PAGE 1 OF 2)

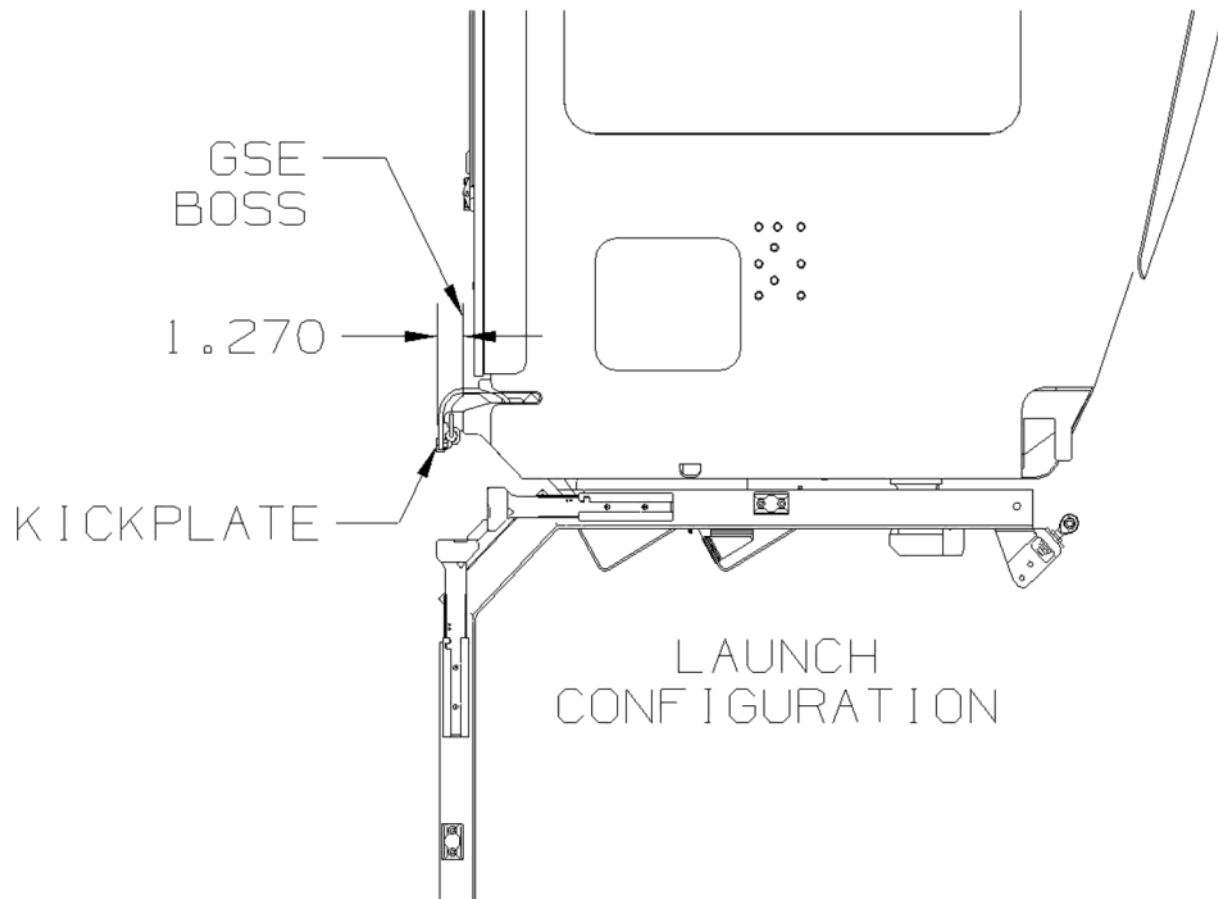


FIGURE 3.1.1.1-1 COMBUSTION INTEGRATED RACK GROUND OPERATIONS RACK PROTRUSIONS (PAGE 2 OF 2)

3.1.1.2 MULTI-PURPOSE LOGISTICS MODULE INTERFACES

- A. MPLM interfaces for rack attach points A, B, (lower rear attach points) C, D (upper kneebrace attach points) and pivot points I, J are identified in SSP 41017 part 2, Figure 3.1.1-1. Any MPLM location restrictions are identified in Figure 3.1.1.2-1, Multi-Purpose Logistics Module Rack Restrictions.

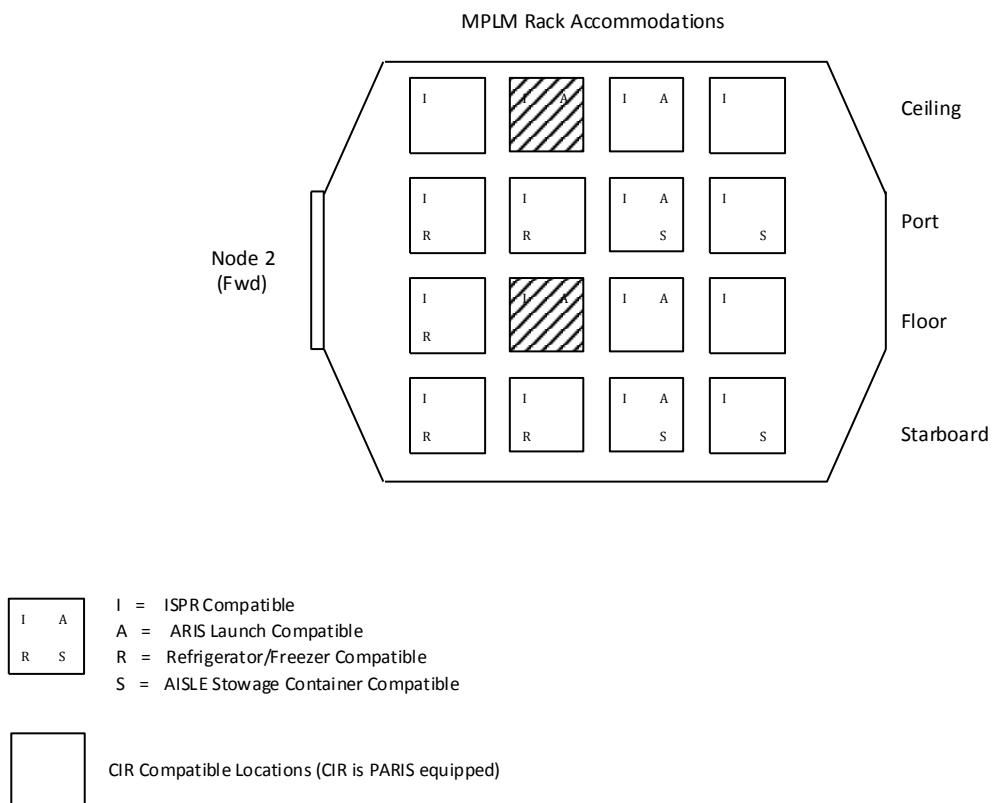
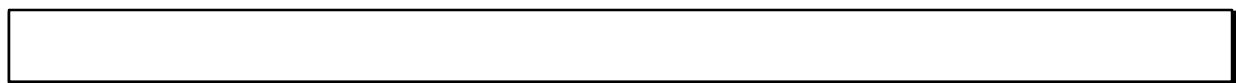


FIGURE 3.1.1.2-1 MULTI-PURPOSE LOGISTICS MODULE RACK RESTRICTIONS

- B. The CIR Control mass is defined in Table 3.1.1.2-1, Combustion Integrated Rack, Integrated Mass.

The CIR has a modal frequency of 23 Hz*.



**TABLE 3.1.1.2-1 COMBUSTION INTEGRATED RACK
INTEGRATED MASS**

| PHASE | MASS (lbs) |
|-----------------|---------------------|
| Ground Handling | 2424.4 ¹ |
| Launch | 1773 |
| On-Orbit | 2424.4 ² |
| Landing | 1773 |

3.1.1.3 INTERNATIONAL SPACE STATION INTERFACES

- A. The CIR interfaces to the ISS at attachment point locations C, D, I and J as defined in SSP 41017 Part 1, Section 3.2.1.1.1 and SSP 41017 Part 2, Section 3.1.1. The NASA and JAXA ISPRs meet these interfaces. PaRIS equipped racks attachment locations are defined in SSP 50251 Part 1 and Part 2.

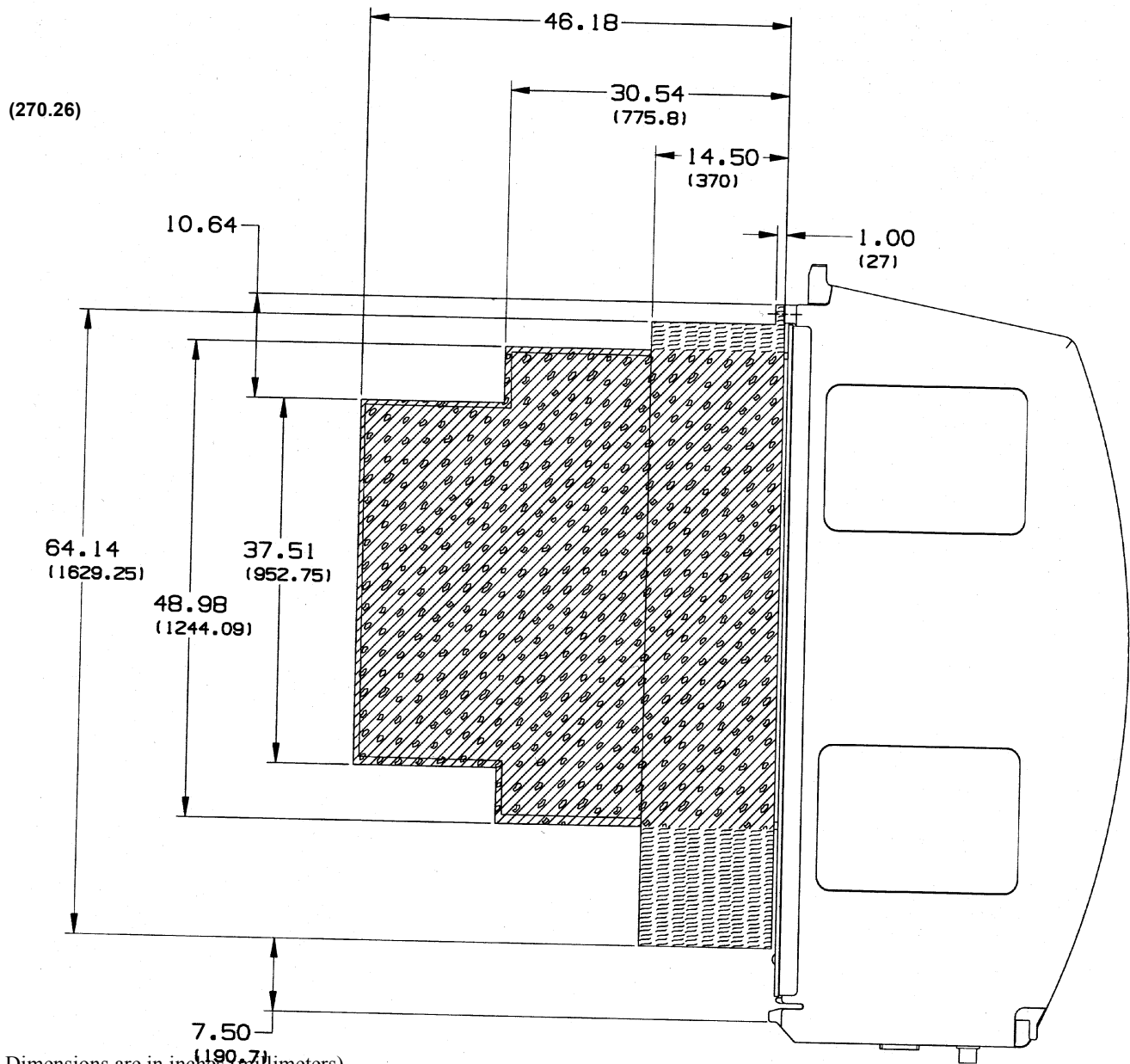
The CIR has been granted program approval to design for accommodation in the USL only.

- B. CIR Temporary on-orbit protrusions are identified in Figure 3.1.1.3-1*, Rack Door/Optics Bench Protrusion Envelope. PaRIS protrusions are identified in Figure 3.1.1.3-2, Upper and Lower PaRIS Snubber Protrusions. The CIR can be rotated a minimum of 80 degrees from the LAB1S2 rack location after procedural reconfiguration of the PaRIS hardware as required to support rack rotation.

- C. The CIR Portable Fire Extinguisher (PFE) access port, Rack Power Switch, Smoke Indicator Light-Emitting Diode (LED), and all Caution and Warning labels must be clearly visible and unobstructed. A keep-out zone must be maintained for insertion of the PFE bottle. Figure 3.1.1.3-3 identifies the location of the PFE access port, Rack Power Switch, and Smoke Indicator LED.

- D. The CIR on-orbit mass is defined in Table 3.1.1.2-1.

(1173)



Notes: 1. Dimensions are in inches (millimeters).

2. Rack-to-Rack Protrusion interfaces are defined in Exception 57217-NA-0029B.

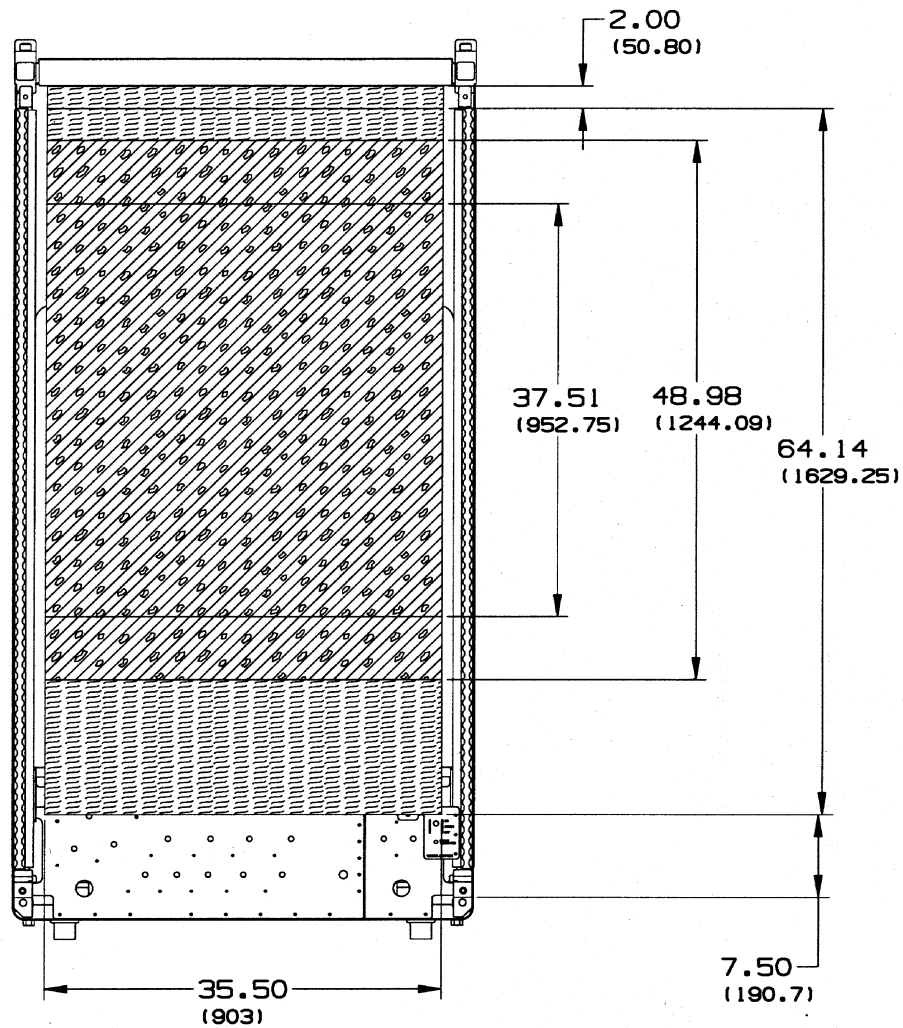


Exception
57217-NA-0001A



Exception
57217-NA-0003

**FIGURE 3.1.1.3-1 RACK DOOR/OPTICS BENCH PROTRUSION
ENVELOPE (PAGE 1 OF 2)**

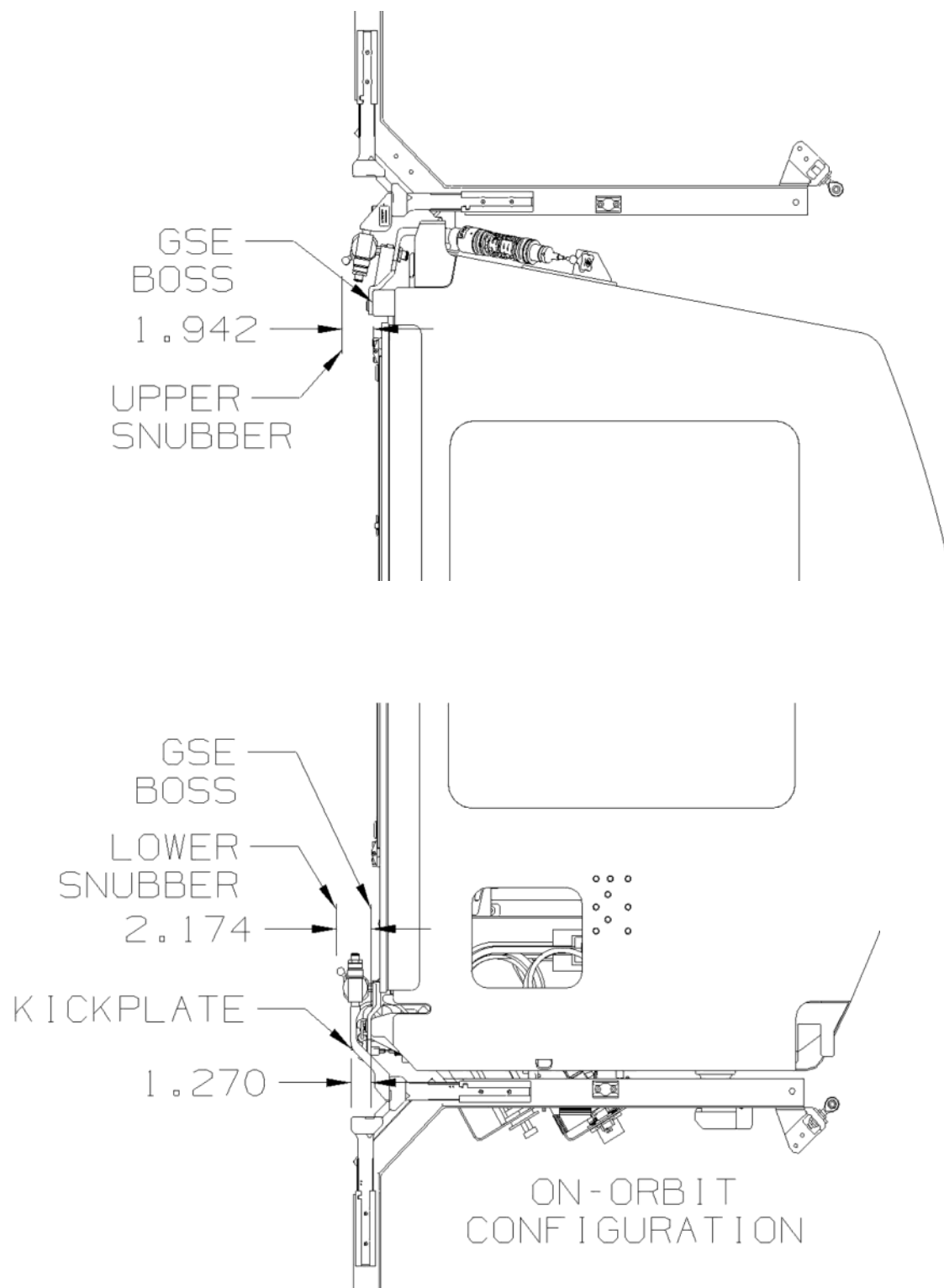


Note: Dimensions are in inches

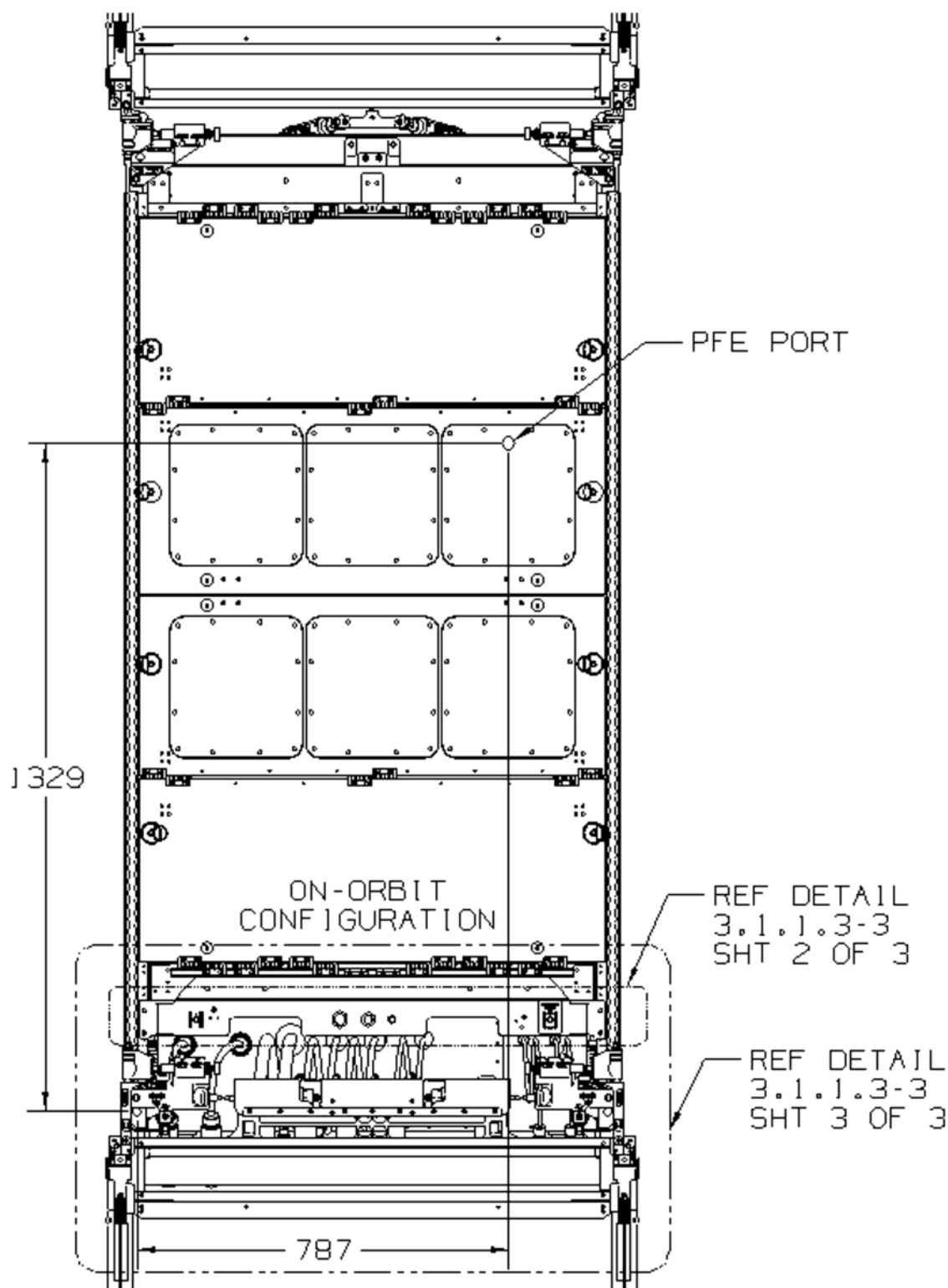
Exception
57217-NA-0001A

Exception
57217-NA-0003

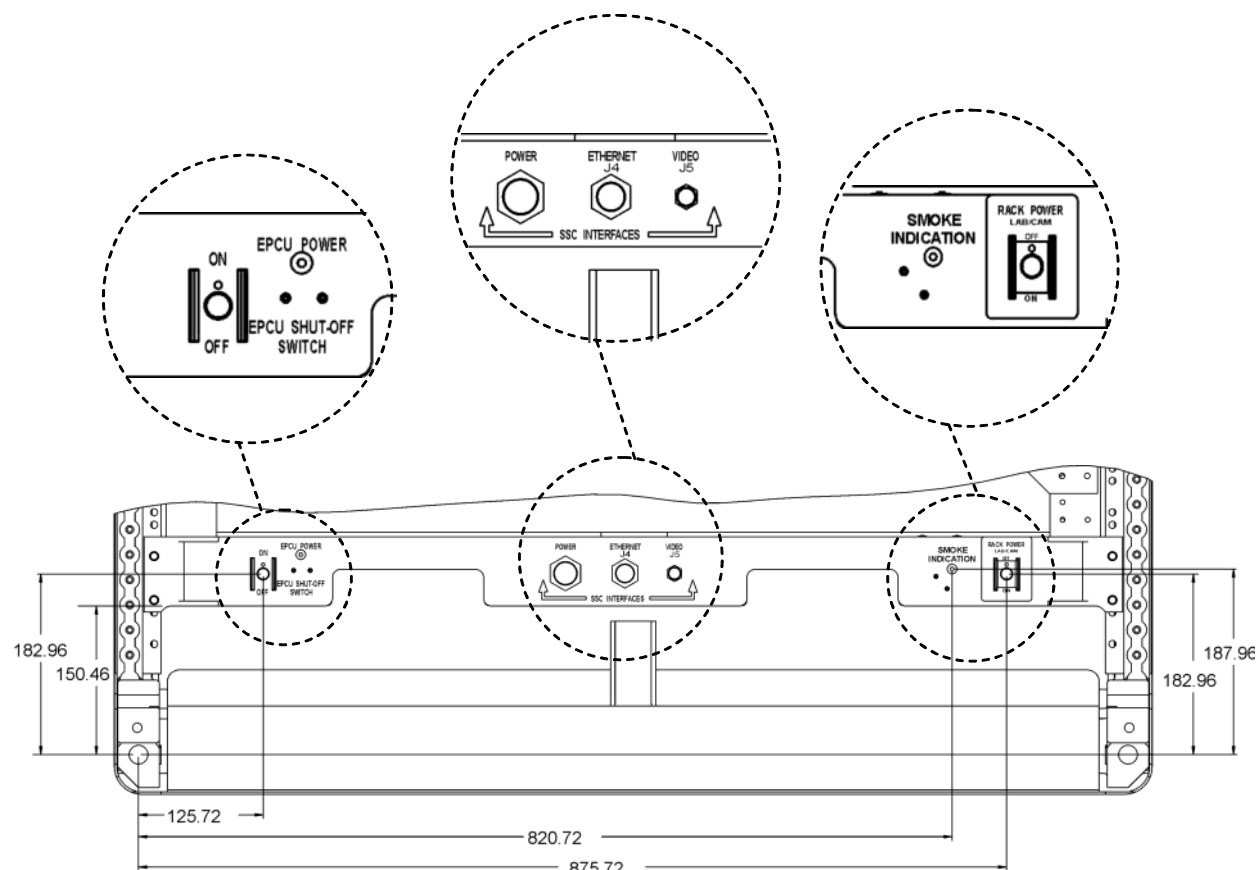
FIGURE 3.1.1.3-1 RACK DOOR/OPTICS BENCH PROTRUSION
ENVELOPE (PAGE 2 OF 2)



**FIGURE 3.1.1.3-2 UPPER AND LOWER PASSIVE RACK ISOLATION
SYSTEM SNUBBER PROTRUSIONS**



**FIGURE 3.1.1.3-3 PORTABLE FIRE EXTINGUISHER ACCESS PORT,
RACK POWER SWITCH, AND SMOKE INDICATOR LIGHT-EMITTING
DIODE (PAGE 1 OF 3)**



**FIGURE 3.1.1.3-3 PORTABLE FIRE EXTINGUISHER ACCESS PORT,
RACK POWER SWITCH, AND SMOKE INDICATOR LIGHT-EMITTING
DIODE (PAGE 2 OF 3)**

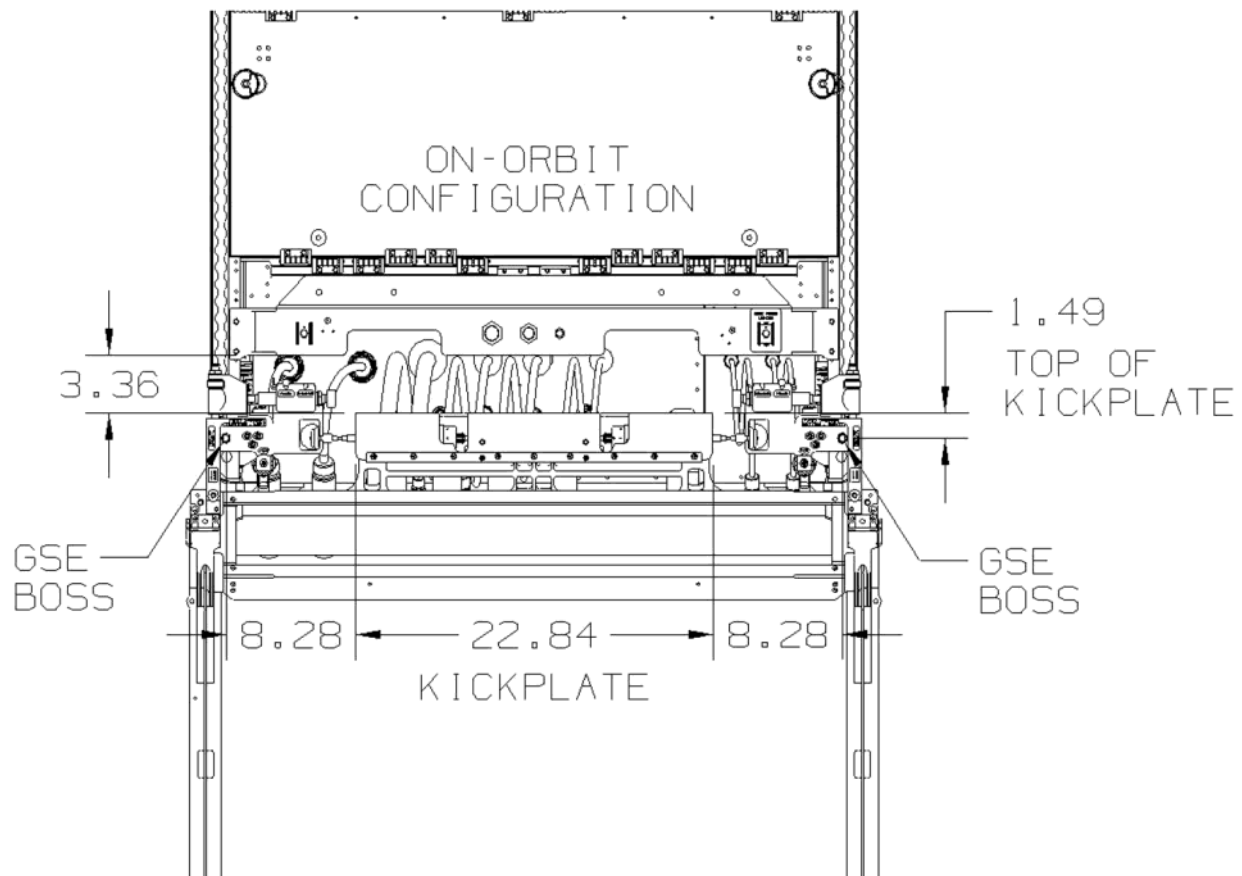


FIGURE 3.1.1.3-3 PORTABLE FIRE EXTINGUISHER ACCESS PORT, RACK POWER SWITCH, AND SMOKE INDICATOR LIGHT-EMITTING DIODE (PAGE 3 OF 3)

3.1.1.3.1 RACK TO RACK UMBILICAL DESIGN

CIR and FIR will have the ability to communicate with each other and therefore extend the capability of each rack. The racks will have a fiber optic communications link between them. The fiber optic cables violate SSP 57000 Paragraph 3.1.1.7, A ON-ORBIT PAYLOAD PROTRUSIONS. The details of the rack to rack umbilical design can be found in exception 57217-NA-0029B.

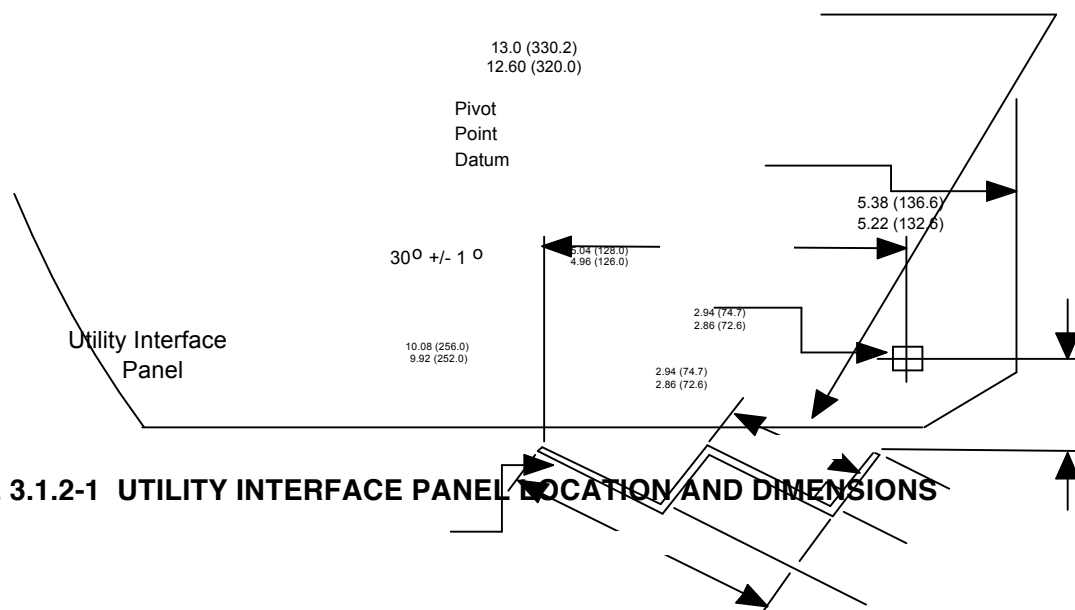
3.1.1.4 LAB WINDOW INTERFACE

CIR does not utilize the lab window.

3.1.2 CONNECTOR INTERFACES

The physical interface of the CIR to ISS system services is at the USL Utility Interface Panel (UIP). The UIP locations and dimensions are shown in Figure 3.1.2-1, Utility Interface Panel Location and Dimensions. The ISS system services connector layout at the UIP is shown in Figure 3.1.2-2, United States Laboratory Specific Panel Connector Locations. The ISS system

services connectors are defined in Table 3.1.2-1, International Space Station System Services Connector Part Numbers. Rack Envelope



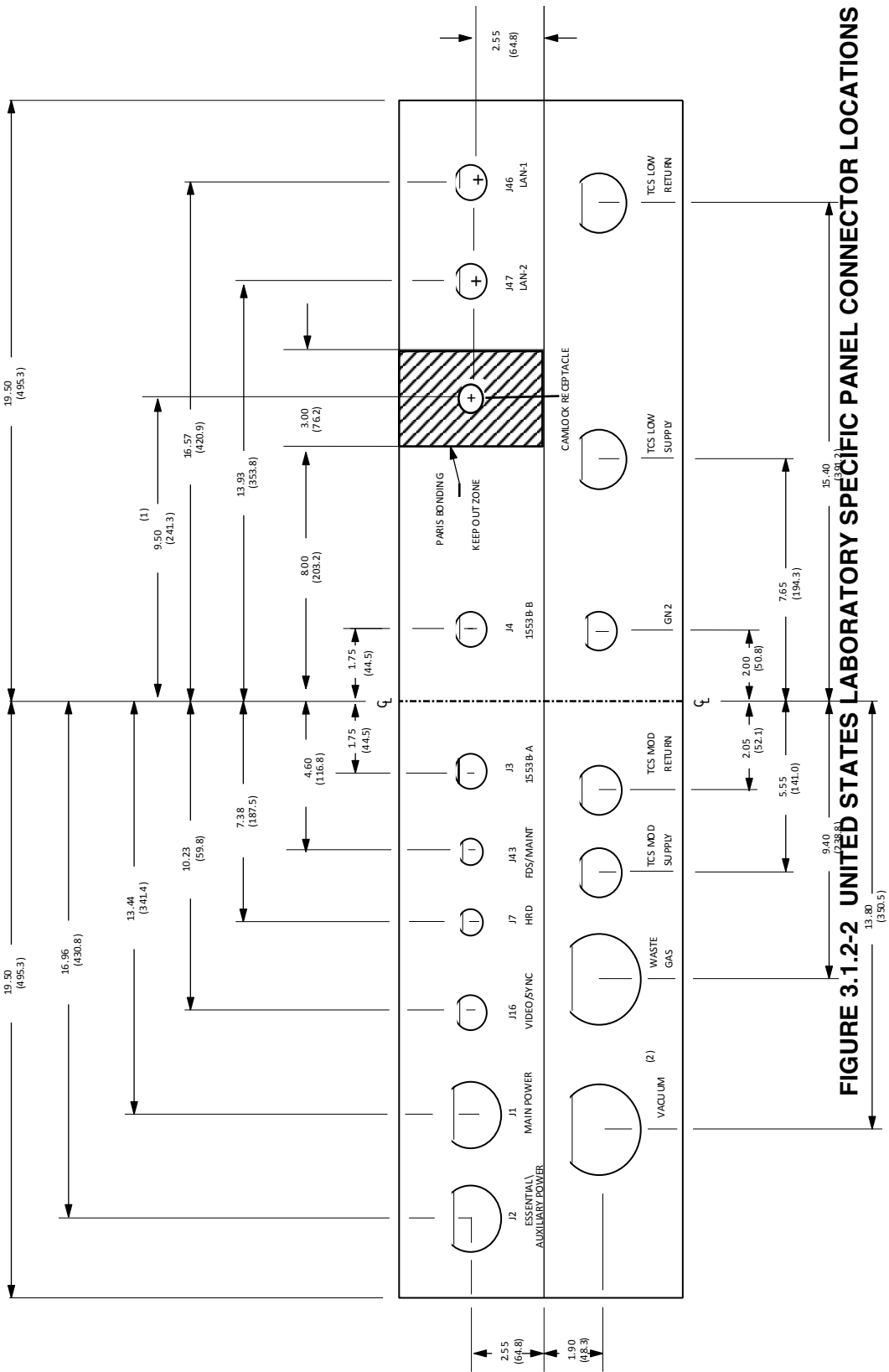


FIGURE 3.1.2-2 UNITED STATES LABORATORY SPECIFIC PANEL CONNECTOR LOCATIONS

NOTE:
1) Camlock Receptacle, part number 991R2-1BP, to be installed at location shown.
2) Not available on USL Racks LAB1P1, LAB1P2, LAB1P4, LAB1D3.

**TABLE 3.1.2-1 INTERNATIONAL SPACE STATION SYSTEM SERVICES
CONNECTOR PART NUMBERS**

| ISS Resource | ISS Connector Designation | ISS UIP Receptacle Part Number | | Rack UIP Mating Connector Part Number |
|-------------------------------|---------------------------|--|-----|--|
| UIP | | | | |
| Main Power | J1 | NATC07T25LN3SN | P1 | NATC06G25LN3PN |
| Essential/Auxiliary Power | J2 | NATC07T25LN3SA | P2 | NATC06G25LN3PA |
| MIL-STD-1553B Bus A | J3 | NATC07T15N35SN | P3 | NATC06G15N35PN |
| MIL-STD-1553B Bus B | J4 | NATC07T15N35SA | P4 | NATC06G15N35PA |
| HRDL | J7 | NATC07T13N4SN | P7 | NATC06G13N4PN |
| Optical Video | J16 | NATC07T15N97SB | P16 | NATC06G15N97PB |
| FDS/Power | J43 | NATC07T13N35SA | P43 | NATC06G13N35PA |
| EWACS | J45 | NATC07T11N35SC | | N/A |
| LAN-1 | J46 | NATC07T11N35SA | P46 | NATC06G11N35PA |
| LAN-2 | J47 | NATC07T11N35SB | P47 | NATC06G11N35PB |
| Electrical video | J77 | NATC07T13N35SB | | N/A |
| TCS Moderate Temp Loop Supply | TCS MOD SUPPLY | 683-16348, Male, Category 6, Keying B | | 683-16348, Female, Category 6, Keying B |
| TCS Moderate Temp Loop Return | TCS MOD RETURN | 683-16348, Male, Category 6, Keying C | | 683-16348, Female, Category 6, Keying C |
| TCS Low Temp Loop Supply | TCS LOW SUPPLY | 683-16348, Male, Category 6, Keying B | | N/A |
| TCS Low Temp Loop Return | TCS LOW RETURN | 683-16348, Male, Category 6, Keying C | | N/A |
| Waste Gas System | WASTE GAS | 683-16348, Male, Category 3, Keying B | | 683-16348, Female, Category 3, Keying B |
| Vacuum Resource System | VACUUM | 683-16348, Male, Category 3, Keying A | | N/A |
| Gaseous Nitrogen | GN2 | 683-16348, Male, Category 8, Keying B | | 683-16348, Female, Category 8, Keying B |
| Argon | Ar | 683-16348, Male, Category 8, Keying C | | N/A |
| Helium | He | 683-16348, Male, Category 8, Keying E | | N/A |
| Carbon Dioxide | CO2 | 683-16348, Male, Category 8, Keying D | | N/A |
| Fluid Services | | | | |
| Potable Water | Potable Water | 683-16348, Male, Category 7, Keying D | | N/A |
| Fluid System Servicer | Fluid System Services | 683-16348, Male, 0.50 inch QD, universal (no keying) | | 683-16348, Female, 0.50 inch QD, universal (no keying) |

Notes: 1. CIR does not have a Vacuum Resource System (VRS) umbilical.
2. CIR uses ARIS umbilicals for PaRIS interfaces.

3.2 ELECTRICAL POWER INTERFACES

3.2.1 CONNECTORS

3.2.1.1 UTILITY INTERFACE PANEL

The CIR electrical power connectors, J1 and J2, interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The J1 and J2 part numbers are defined in Table 3.1.2-1 and the pin assignments are defined in Figure 3.2.1.1-1, Utility Interface Panel Electrical Power Connectors and Pin Assignments.

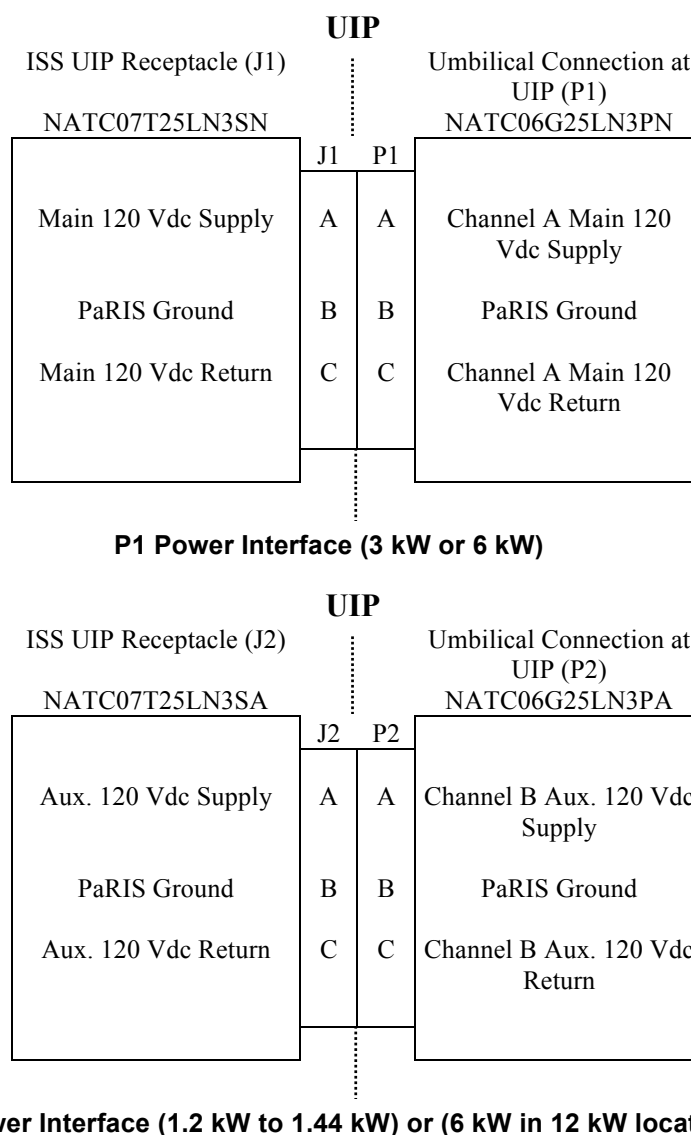


FIGURE 3.2.1.1-1 UTILITY INTERFACE PANEL ELECTRICAL POWER CONNECTORS AND PIN ASSIGNMENTS

3.2.1.2 UTILITY OUTLET PANEL

The CIR will not require an interface to the Utility Outlet Panel (UOP).

3.2.2 ELECTROMAGNETIC COMPATIBILITY

3.2.2.1 BONDING

Standard bonding interfaces will be removed for CIR operations. Paragraph 3.2.2.2 describes the ISS to CIR bonding.

3.2.2.2 PASSIVE RACK ISOLATION SYSTEM INTERNATIONAL STANDARD PAYLOAD RACK BONDING

Bonding for PaRIS ISPRs is accomplished through the use of a mesh strap that is provided as part of the PaRIS standard umbilical assembly (which is part of the PaRIS Kit). PaRIS ISPRs are bonded to the ISS through an interface on the rack UIP and on the UIP module standoff.

The location of the bonding interface receptacle on module structure is defined in Figure 3.1.2-2. The receptacle part number is 991R2-1BP (built by Camlock Germany) and will be supplied and installed by the module provider.

The PaRIS provided bonding strap will include captive fasteners used for mating the bonding strap to the module provided receptacle. Bonding strap mating surface will be nickel plated on the module side to ensure conductivity. The PaRIS provided bonding strap will include captive fasteners used for mating the bonding strap to the module provided receptacle as shown in SSP 50251 Part 2, Figure 3.2.5.2-1.

3.2.3 POWER QUALITY

The CIR will receive power that complies with SSP 30482, Electric Power Specifications and Standards, Vol. 1: EPS Performance Specifications.

3.2.4 POWER HANDLING CAPABILITY

Specific characteristics of ISPR locations are shown in Table 3.2.4-1, International Standard Payload Rack Locations with Specific Electrical Power System Characteristics.

TABLE 3.2.4-1 INTERNATIONAL STANDARD PAYLOAD RACK LOCATIONS WITH SPECIFIC ELECTRICAL POWER CHARACTERISTICS

| LOCATION | MAIN (kW) | MAIN RPC CURRENT RATING (Amps) | AUXILIARY RPC CURRENT RATING (Amps) | RPC TYPE main/aux. |
|----------|-----------|--------------------------------|-------------------------------------|--------------------|
| USL | | | | |
| LAB1O1 | 3 | 25 | 12 | VI/V |
| LAB1O2 | 3 | 25 | 12 | VI/V |
| LAB1O3 | 12 | *2 - 50 | *1 OF 2 - 50 | III/III |
| LAB1O4 | 6 | 50 | 12 | III/V |
| LAB1O5 | 3 | 25 | 12 | VI/V |
| LAB1S1 | 3 | 25 | 12 | VI/V |
| LAB1S2 | 6 | 50 | 12 | III/V |
| LAB1S3 | 12 | *2 - 50 | *1 OF 2 - 50 | III/III |
| LAB1S4 | 6 | 50 | 12 | III/V |
| LAB1D3 | 3 | 25 | 12 | VI/V |
| LAB1P1 | 6 | 50 | 12 | III/V |
| LAB1P2 | 12 | *2 - 50 | *1 OF 2 - 50 | III/III |
| LAB1P4 | 6 | 50 | 12 | III/V |

* 12 kW Locations receive power from two independent 6 kW power feeds. Each 6 Kw feed contains a Type III Remote Power Controller (RPC) for upstream circuit protection.

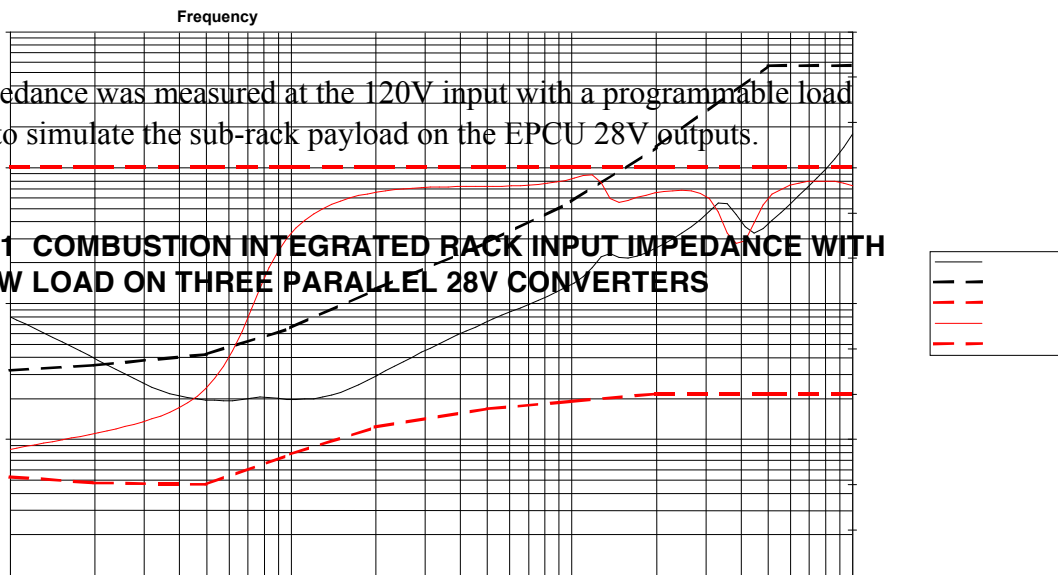
3.2.5 IMPEDANCE LIMITS

3.2.5.1 LOAD IMPEDANCE LIMITS

The CIR load impedance magnitude and phase limits at the UIP interface is defined in Figure 3.2.5.1-1, Combustion Integrated Rack, Input Impedance with 3 kW Load on Three Parallel 28 V Converters, Figure 3.2.5.1-2, Combustion Integrated Rack, Input Impedance with 112 W Load on Three Parallel 28 V Converters, and Figure 3.2.5.1-3, Combustion Integrated Rack, Input Impedance with 2 kW Load on the Six 120 V Outputs.

Note: The input impedance was measured at the 120V input with a programmable load bank utilized to simulate the sub-rack payload on the EPCU 28V outputs.

FIGURE 3.2.5.1-1 COMBUSTION INTEGRATED RACK INPUT IMPEDANCE WITH 3KW LOAD ON THREE PARALLEL 28V CONVERTERS



10

1

0.1

0.01

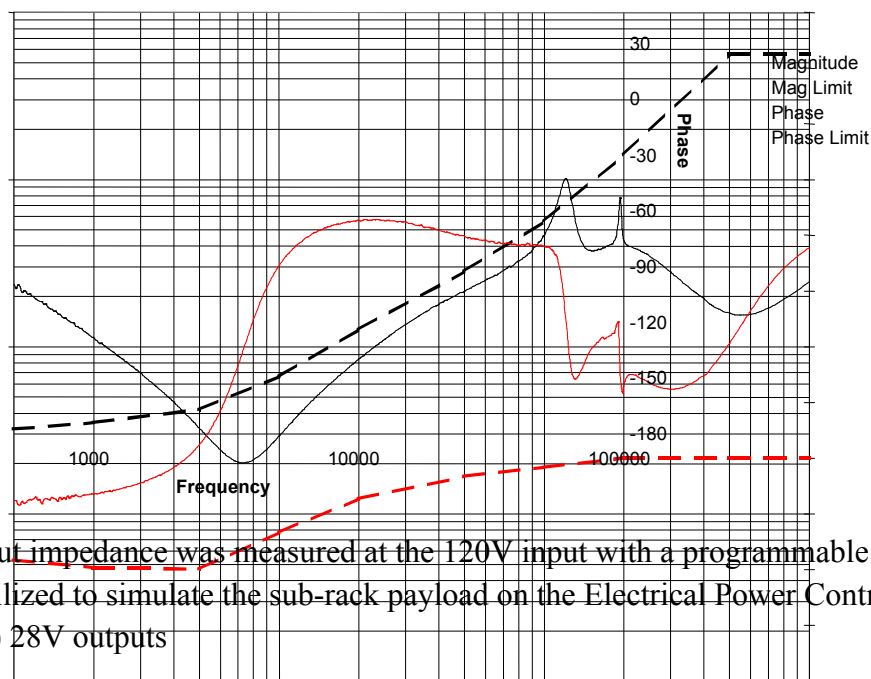
100

150

120

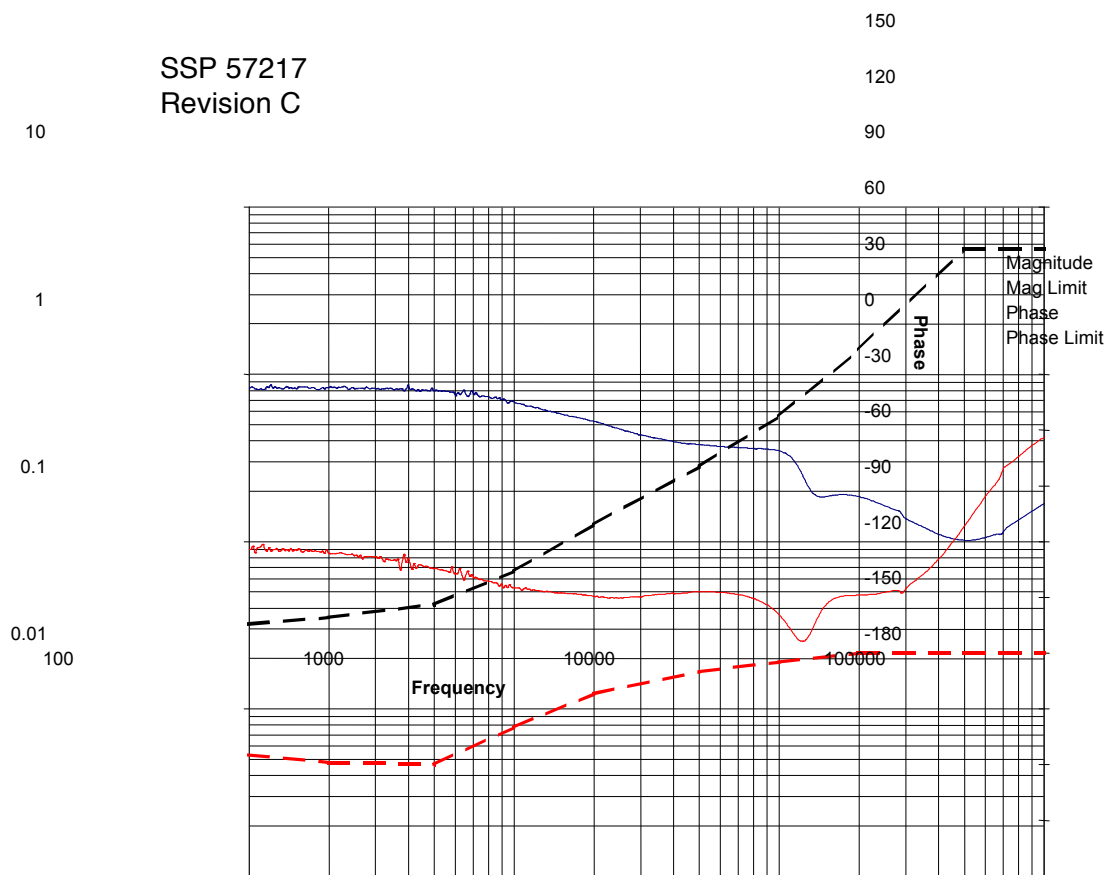
90

60



Note: The input impedance was measured at the 120V input with a programmable load bank utilized to simulate the sub-rack payload on the Electrical Power Control Unit (EPCU) 28V outputs

FIGURE 3.2.5.1-2 COMBUSTION INTEGRATED RACK, INPUT IMPEDANCE WITH 112 W LOAD ON THREE PARALLEL 28 V CONVERTERS



Note: The input impedance was measured at the 120V input with a programmable load bank utilized to simulate the sub-rack payload on the EPCU 120 V outputs

FIGURE 3.2.5.1-3 COMBUSTION INTEGRATED RACK INPUT IMPEDANCE WITH 2 KW LOAD ON THE SIX 120 V OUTPUTS

3.2.5.2 SOURCE IMPEDANCE LIMITS

- A. The source impedance at UIP locations, except MPLM rack locations, will meet the limits as shown in Figure 3.2.5.2-1, 3 kW Interface B Power Source Impedance Limits, Figure 3.2.5.2-2, 6 kW Interface B Power Source Impedance Limits, and Figure 3.2.5.2-3, 1.2 - 1.44 kW Interface B Power Source Impedance Limits, for power bus with single DC to DC Converter Unit (DDCU).
- B. CIR will not utilize the UOP connection, therefore, the source impedance limits at the UOP are not applicable.
- C. The source impedance at UIP locations, except MPLM rack locations, will meet the limits as shown in Figure 3.2.5.2-4, 3 kW Interface B Power Source Impedance Limits for Two DC to DC Converter Units in Parallel, Figure 3.2.5.2-5, 6 kW Interface B Power Source Impedance Limits for Two DC to DC Converter Units in Parallel, and Figure 3.2.5.2-6, 1.2 - 1.44 kW Interface B Power Source Impedance for Two DC to DC Converter Units in Parallel, for power bus with two DDCUs in parallel.

10.

1.

0.1

0.01

10

90

60

30

0

-30

-60

-90

10

Note: This is for one DDCU as the source

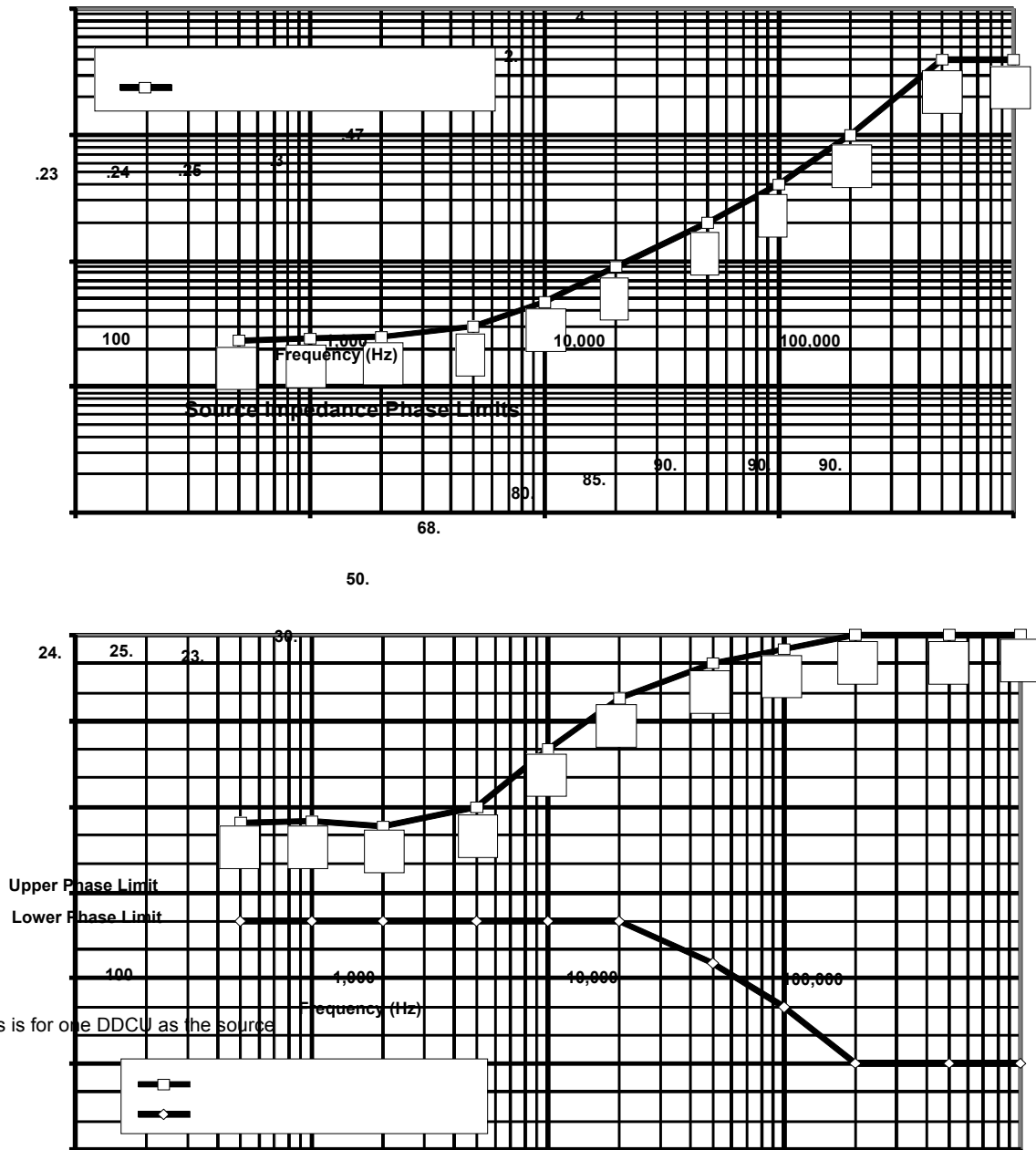


FIGURE 3.2.5.2-1 3 KW INTERFACE B POWER SOURCE IMPEDANCE LIMITS

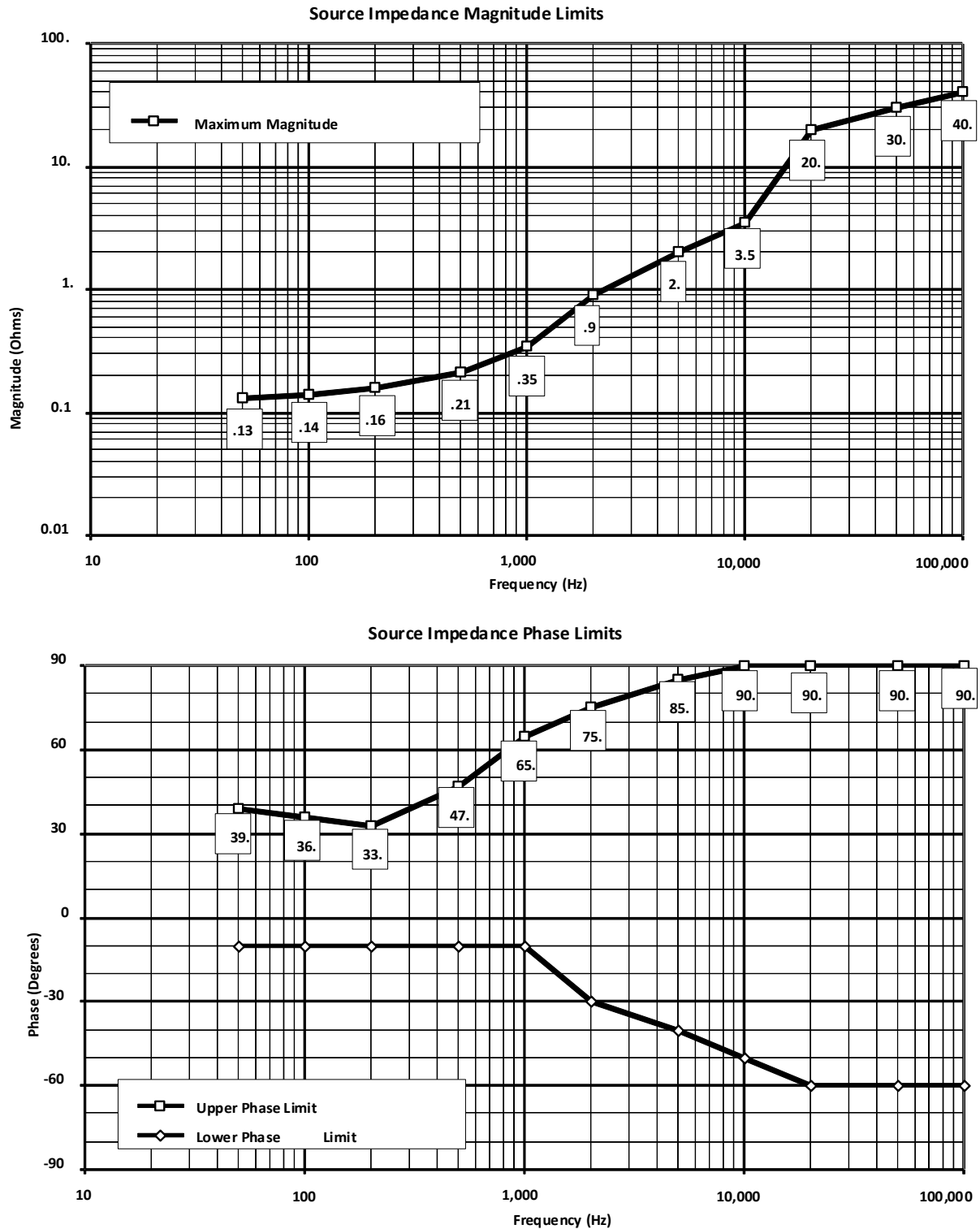
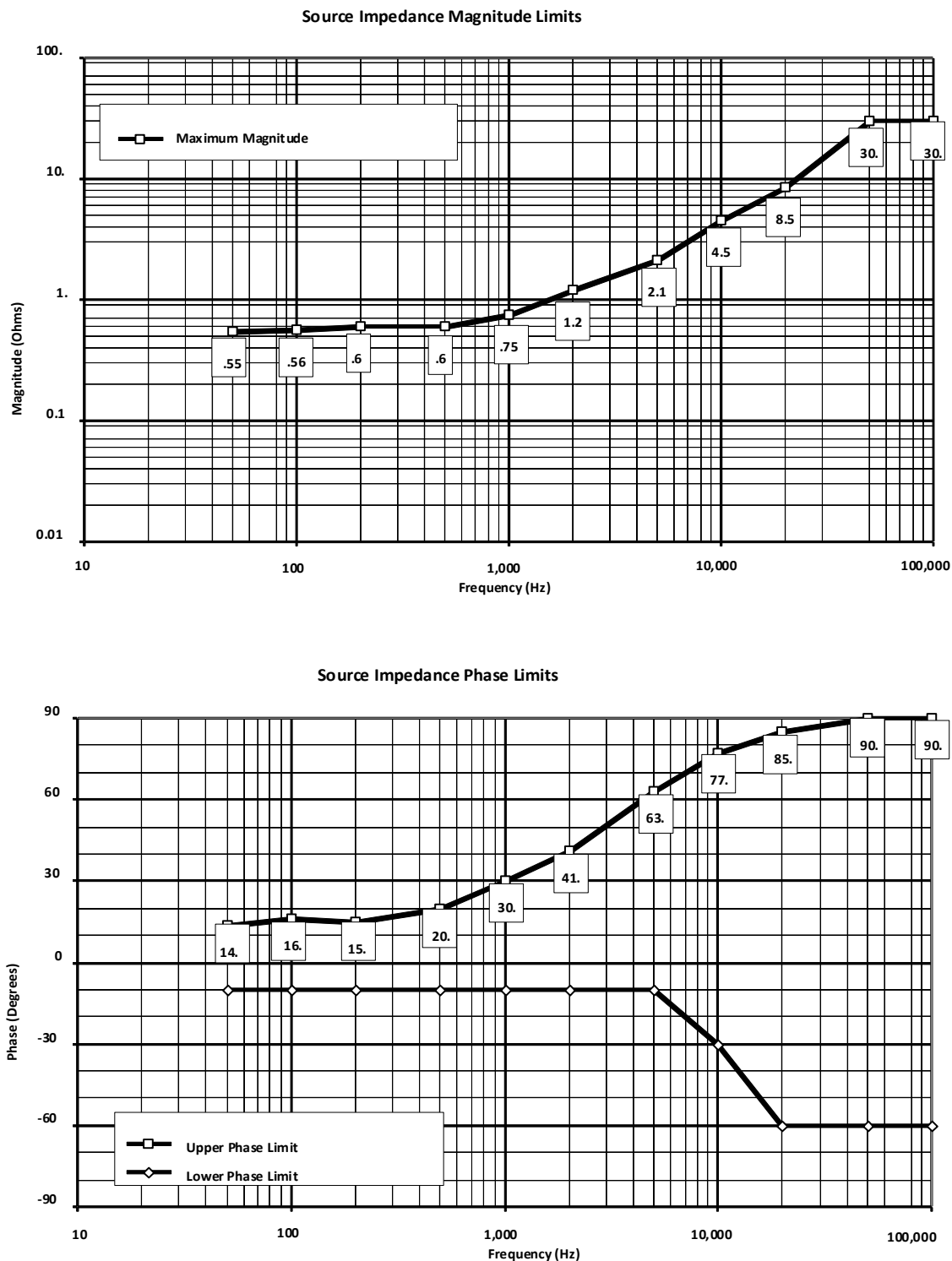


FIGURE 3.2.5.2-2 6 KW INTERFACE B POWER SOURCE IMPEDANCE LIMITS



Note: This is for one DDCU as the source

FIGURE 3.2.5.2-3 1.2 – 1.44 KW INTERFACE B POWER SOURCE IMPEDANCE LIMITS

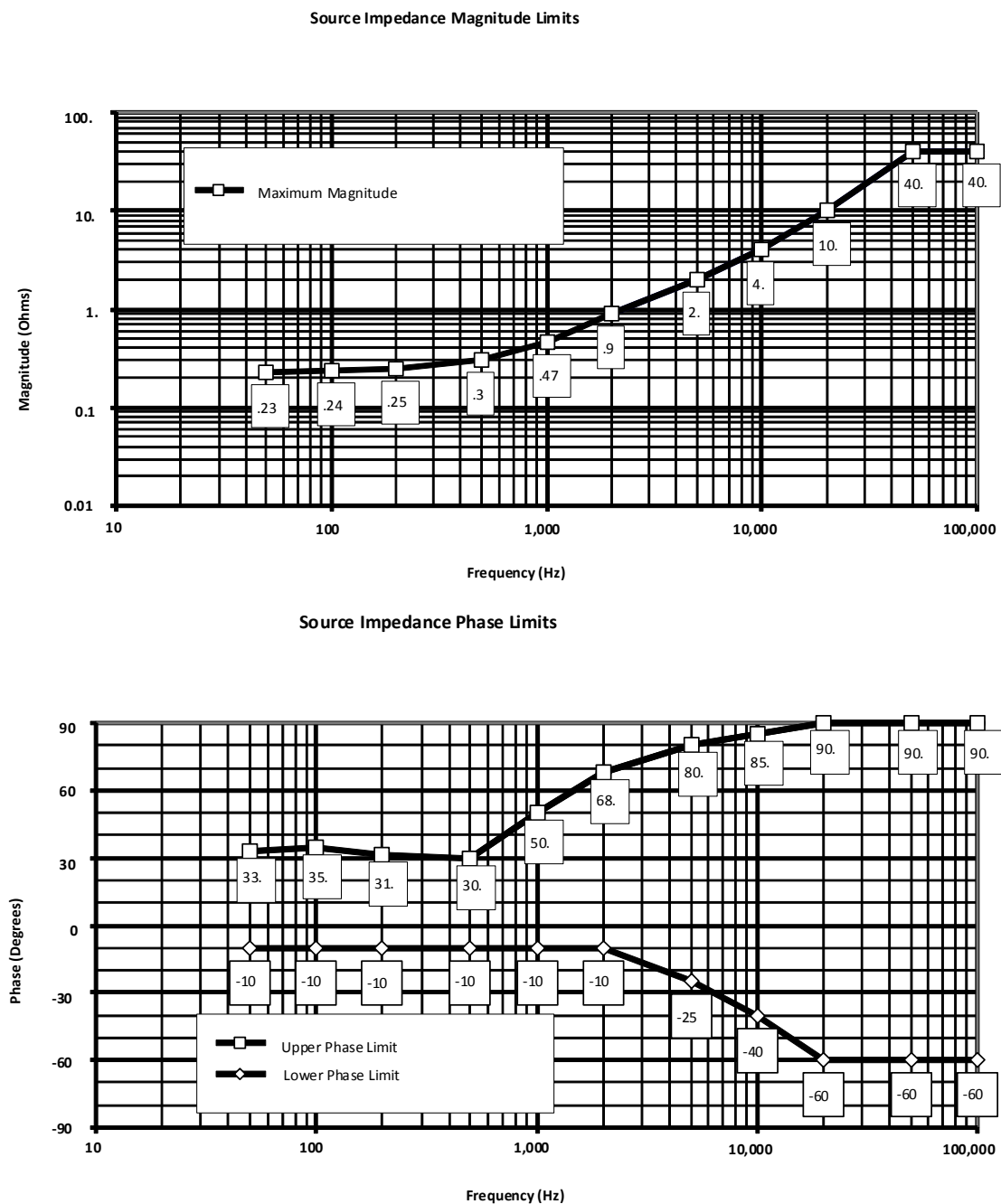
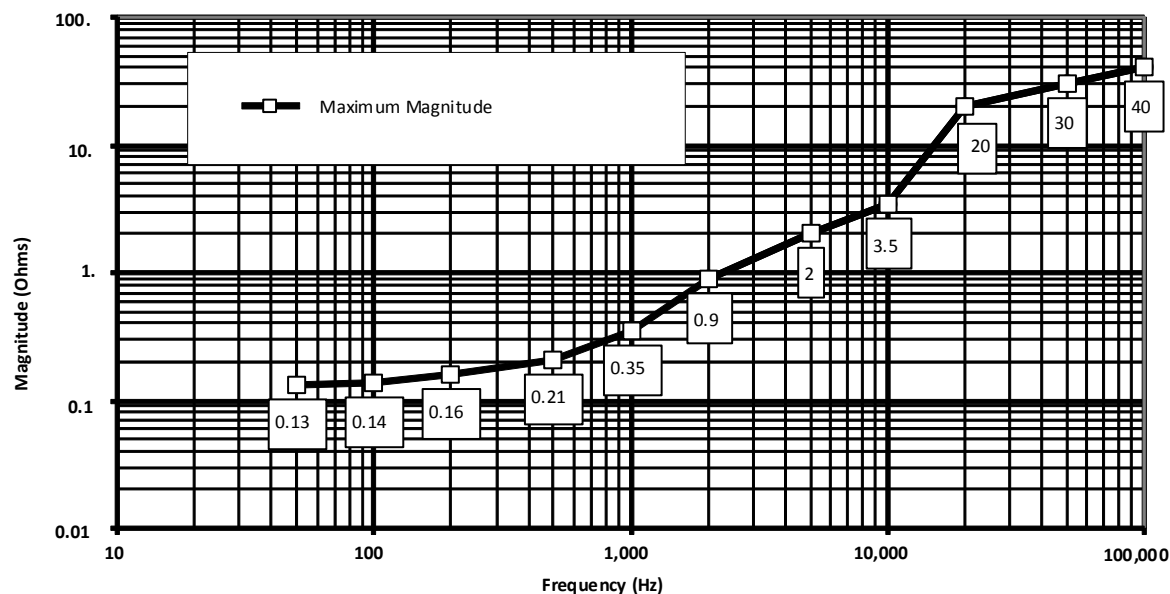


FIGURE 3.2.5.2-4 3 KW INTERFACE B POWER SOURCE IMPEDANCE LIMITS FOR TWO DC TO DC CONVERTER UNITS IN PARALLEL

Source Impedance Magnitude Limits



Source Impedance Phase Limits

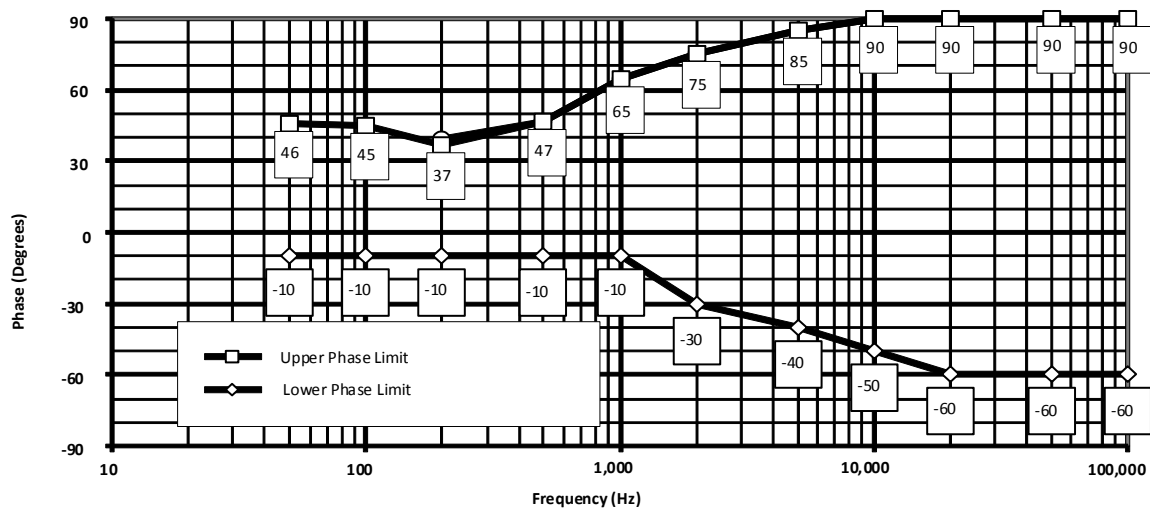


FIGURE 3.2.5.2-5 6 KW INTERFACE B POWER SOURCE IMPEDANCE LIMITS FOR TWO DC TO DC CONVERTER UNITS IN PARALLEL

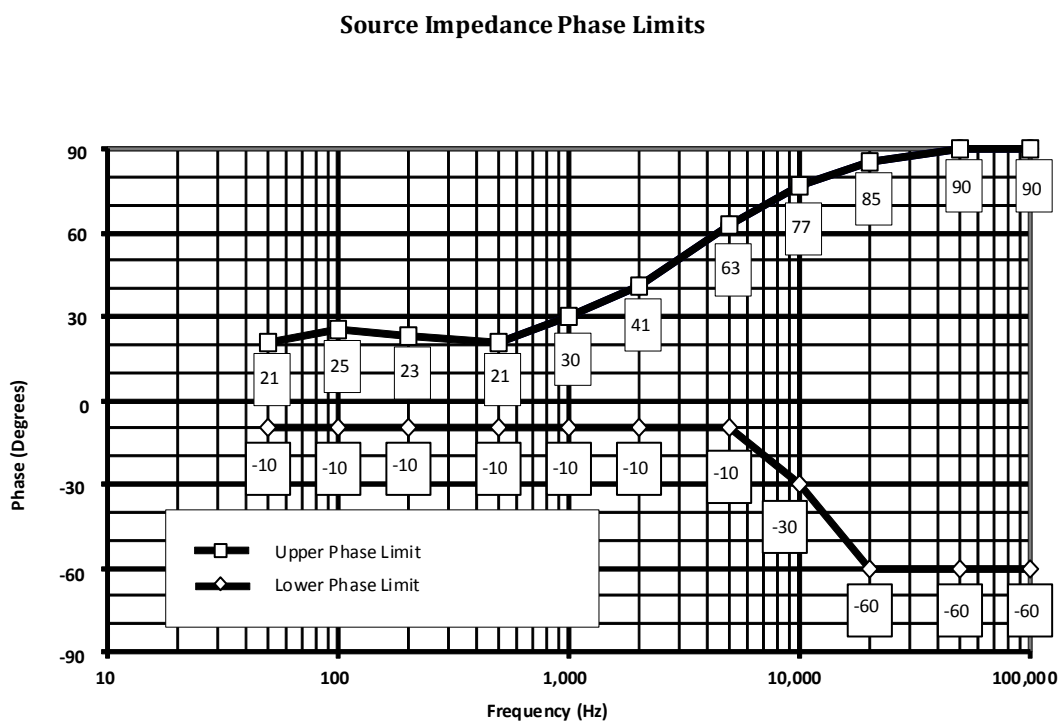
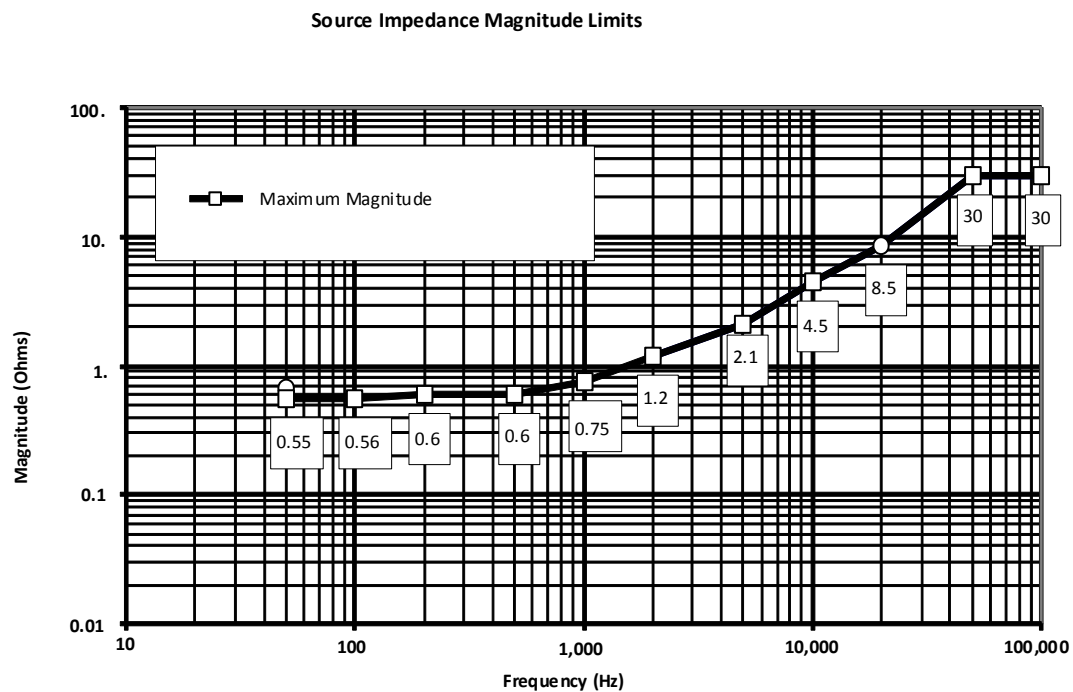


FIGURE 3.2.5.2-6 1.2 – 1.44 KW INTERFACE B POWER SOURCE IMPEDANCE FOR TWO DC TO DC CONVERTER UNITS IN PARALLEL

3.2.6 REMOTE POWER CONTROLLER OVERLOAD LIMITS

Simultaneous Power consumption from both ISS busses is possible with the CIR EPCU. By utilizing ground initiated software commands, the EPCU can be configured to limit the total current drawn from either bus. If loads were turned on that would exceed this allocation, the EPCU provides load-shedding capabilities within 5 Milliseconds (ms) of exceeding the power allocation. The following is an example of how the process would work.

Bus A is allocated 8A and Bus B is allocated 4A. Loads can be assigned a load-shed priority of 0 through 15, with 0 indicating never shed and 15 indicating the lowest priority or first to be shed. If two of the EPCU internal converters are assigned to Bus A and one is assigned to Bus B, two-thirds of the total current draw will be on Bus A and one-third will be on Bus B. When the Bus B allocation limit of 4A is reached, additional loads will cause Bus A current draw to increase only until its allocation limit of 8A is reached. At this point, 8A are being drawn from Bus A and 4A are being drawn from Bus B. If for example, another load is added that represents an additional 2A load, the following will happen: All loads that are assigned a priority of 15 will be turned off with 5 ms, if after those loads are removed, the bus allocation is still being exceeded, loads with priorities of 14 will be shut off within another 5ms. This process will continue until the power drawn is below the allocation limit.

Figure 3.2.6-2, Flexible Remote Power Controller 120 Volts Direct Current (Vdc) Short Circuit Current, shows the amount of current drawn if one of the 120 Vdc FRPCs were shorted. Figure 3.2.6-1, Combustion Integrated Rack Electrical Power Control Unit, shows the upstream ISS RPCs will not trip before the EPCU begins to shed loads.

Table 3.2.6-1, Detailed Upstream Protection Characteristics, defines the characteristics of the remote power controllers.

The power characteristics defined in Table 3.2.7-1, Combustion Integrated Rack Integrated Rack Power Balance, assume both the Main Feed and Auxiliary Feed are allowed to provide power to the CIR simultaneously as described in the paragraph above. The total power drawn by the CIR is the sum of the Main and AUX power numbers shown in Table 3.2.7-1. CIR can limit the amount of power drawn from the AUX bus to whatever value ISS would want depending on power availability. Based on the values shown in Table 3.2.7-1, Combustion Integrated Rack would set the power allocation for the AUX bus to 12A for nominal operation.

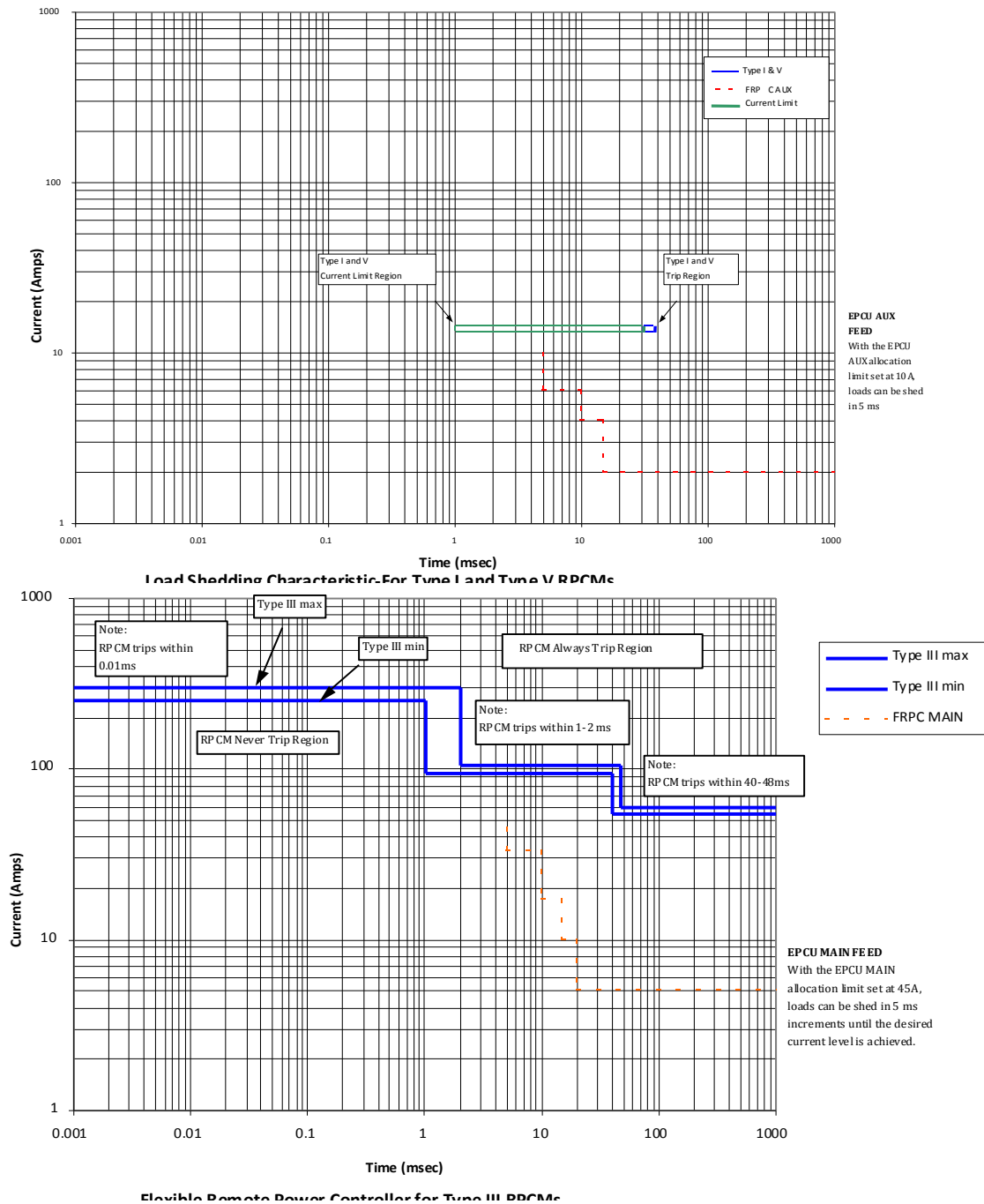
3.2.6.1 MODULE “POWER OFF” RESIDUAL VOLTAGE LEVEL

After switching module Remote Power Control in “OFF-” state, the module still provides a residual voltage at the ISPR interface. Table 3.2.6.1-1, Residual Voltage and Leakage Current at the International Standard Payload Rack Interface.

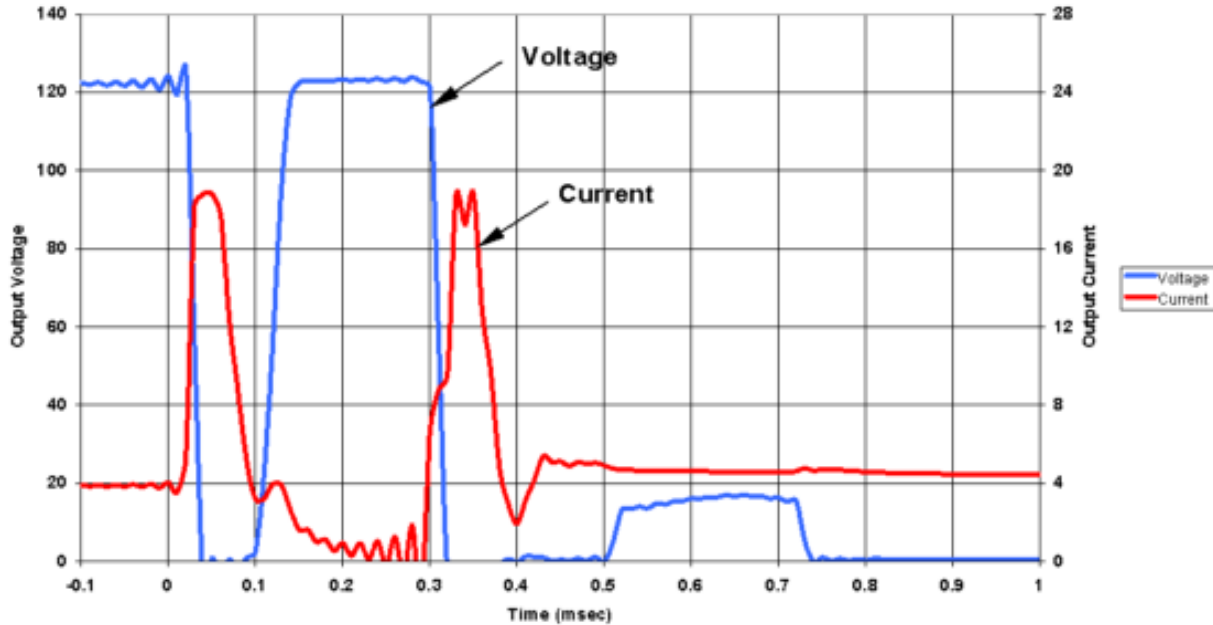
**TABLE 3.2.6.1-1 RESIDUAL VOLTAGE AND LEAKAGE CURRENT AT THE
INTERNATIONAL STANDARD PAYLOAD RACK INTERFACE**

| | USL | APM | JEM |
|---------------------------------|------------|------------|------------|
| Residual voltage in “OFF” State | 10 V | 11.8 V | 6 V |
| Leakage Current | 5 mA | 5 mA | 4 mA |

Note: This table provides information on interface characteristics that the Racks will experience in the modules. These interface characteristics only need to be verified at the module side, and they are **not a requirement on ISPR**.



Note: These figures show the trip coordination between ISS RPCMs and EPCU load shedding. In this example, when the MAIN and AUX channel allocation limits are exceeded, pre-assigned output channels can be shed to bring the current draw down to an acceptable amount. Each step in the current shedding process takes 5ms. If a fault occurs on an FRPC that does not cause the allocation limit on either channel to be exceeded, the fastest time the FRPC can turn off is 100ms. The maximum amount of fault current a FRPC can output is 4.6A amperes for one channel, and multiples of this for paralleled channels. As defined in Figure 3.2.6-2, a 19A transient can exist for about 30 msec before the FRPC current limits at 4.2 to 4.6A.



**FIGURE 3.2.6-2 FLEXIBLE REMOTE POWER CONTROLLER
120 VDC SHORT CIRCUIT CURRENT**

Note: The graph shown in Figure 3.2.6-2 represents the actual test data showing the results of an applied fault to a 120 V EPCU FRPC. The figure shows load current and voltage when a 4 A FRPC load is shorted. The input current will look the same, because there is no energy storage in the FRPC. The voltage is shown being clamped to zero by the fault. The device applying the fault bounced twice, allowing the voltage to recover to 120 V the first time, to about 20 V the second time, then return to zero. In both cases the current reached a maximum of less than 19 A. After the second bounce, the fault lasts long enough to show the current reaching the steady state current limiting value of a little more than 4 A, the current limit range is 4.2 A to 4.6 A. A cleaner fault would have resulted in a much cleaner current waveform, without the bounce. These results should be very typical, since test was performed with the proper DDCU, RPCM, and feeder impedances.

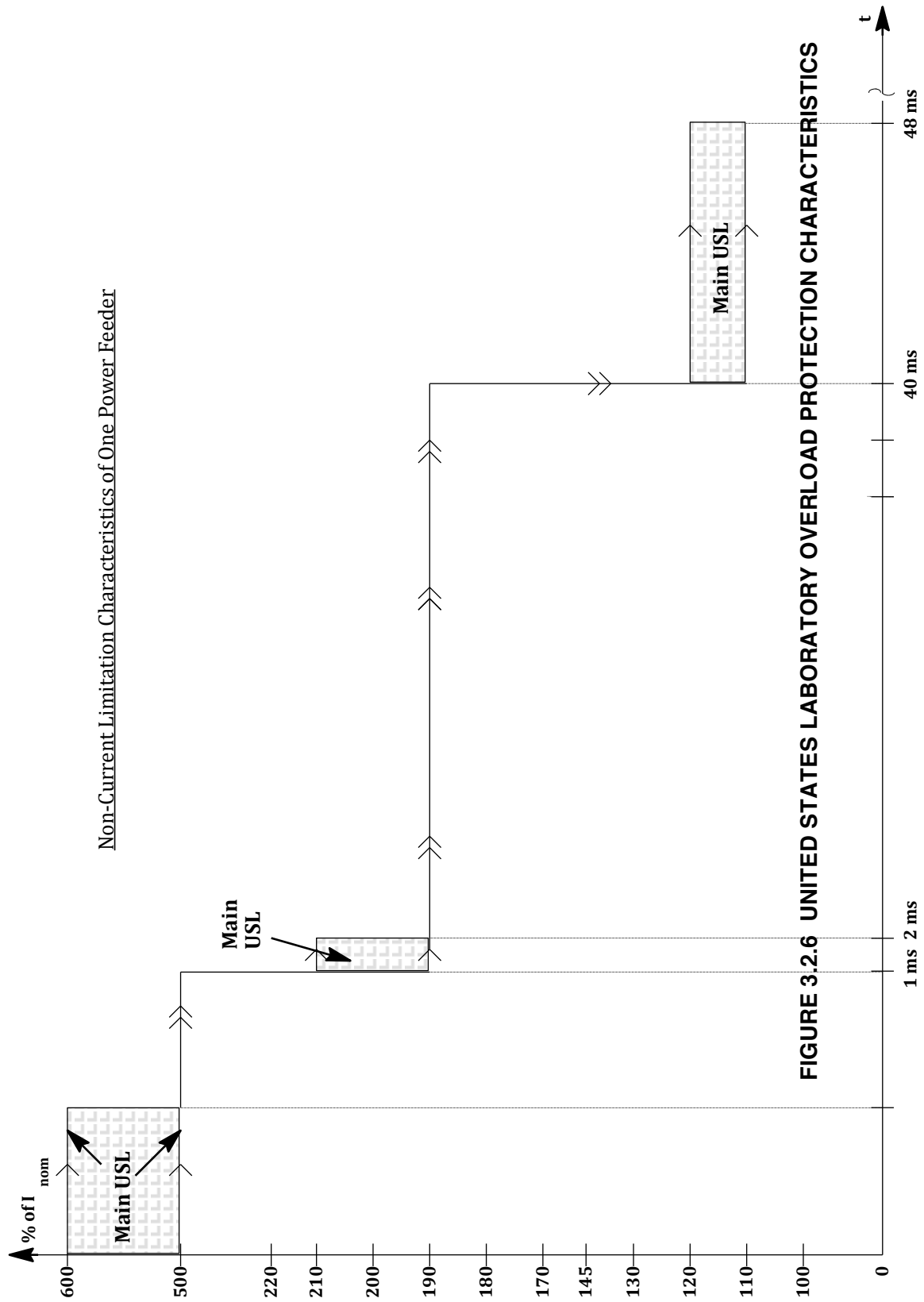


TABLE 3.2.6-1 DETAILED UPSTREAM PROTECTION CHARACTERISTICS

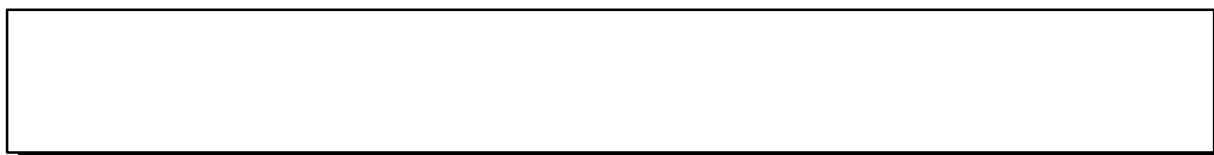
Wires used for the main and auxiliary connections at the CIR represent an exception to the requirement found in SSP 57000, paragraph 3.2.3.1.C. Refer to 57202-NA-0017A and 57217-NA-0027. Table 5.2.2-1 provides the status of all exceptions.

| PWR INTERFACE | MAIN PWR FEEDER | | | | |
|--------------------------------|-----------------------------|-----------------------------|------------------------------|------------------------|-------|
| | CURRENT LIMITATION LEVEL | | MINIMUM TRIP THRESHOLD | TRIP DECISION TIME (1) | |
| | MIN. | MAX | | MIN. | MAX. |
| 5 kW ISPR USL | N/A | N/A | 27.5 A | 40 ms | 48 ms |
| 6 kW ISPR USL | N/A | N/A | 55.0 A | 40 ms | 48 ms |
| 12 kW ISPR USL FEED A/BUS 1 | N/A | N/A | 55.0 A | 40 ms | 48 ms |
| FEED B/BUS 2 | N/A | N/A | 55.0 A | 40 ms | 48 ms |
| PWR INTERFACE | AUX PWR FEEDER | | | | |
| | NOM. POWER | CURRENT LIMITATION LEVEL | | TRIP DECISION TIME (1) | |
| | | MIN. | MAX | MIN. | MAX. |
| ISPR USL | 1.44kW | 13.2A | 14.4 A | 31 ms | 38 ms |

Note: 1) Trip decision time within range of minimum and maximum limiting / trip threshold.

3.2.7 ELECTRICAL POWER CONSUMING EQUIPMENT INTERFACE WITH THE UTILITY INTERFACE PANEL OR UTILITY OUTLET PANEL

The CIR power consumption and current draw is defined in Table 3.2.7-1. The in-rush current for the CIR is shown in Figure 3.2.7-1, Combustion Integrated Rack In-Rush Current. The peak surge current for the CIR, when the subrack payload automated sequence is turned on, is illustrated in Figure 3.2.7-2, Combustion Integrated Rack 28 Vdc Surge Current During the Subrack Payload Automated Sequence. An electrical schematic of the Combustion Integrated Rack is provided in Figure 3.2.7-3*, Combustion Integrated Rack Electrical System Block Diagram.



Simultaneous power consumption from both Main and Auxiliary power buses is possible with the CIR EPCU. By utilizing ground initiated software commands, the EPCU can be configured to limit the total current drawn from either bus. If loads were turned on that would exceed this allocation, the EPCU will draw load shedding capabilities within 5 ms.

EXAMPLE:

Bus A is allocated 8A and Bus B is allocated 4A. Loads can be assigned a load shed priority of 0 through 15 (0 = never shed, 15 = first load to shed). Both buses draw power equally until Bus B

reaches 4A. As the loads increase beyond 4A, Bus A will continue to draw current up to 8A. At this point, 8A is drawn by Bus A and 4A is drawn by Bus B. If an additional 2A load is added, loads with a priority of 15 will be turned off within 5 ms. If the bus allocation is still exceeded after the initial load shed, loads with a priority of 14 will be turned off. This process will continue until the current draw falls below the allocation. Each load shedding step occurs within 5 ms.

**TABLE 3.2.7-1 COMBUSTION INTEGRATED RACK
INTEGRATED RACK POWER BALANCE**

| | Peak (Watts) | Maximum Continuous (Watts) | Keep Alive |
|---------------------------|-------------------------|---|-------------------|
| Prelaunch | N/A | N/A | N/A |
| Ascent | N/A | N/A | N/A |
| On-Orbit | | | |
| S Start-up/Health Check | | | |
| Main Power | N/A | 517 | N/A |
| Auxiliary Power | N/A | 517 | N/A |
| S Environment Preparation | | | |
| Main Power | N/A | 704 | N/A |
| Auxiliary Power | N/A | 704 | N/A |
| S Experiment Operation | | | |
| Main Power | 2065 | 2024 | N/A |
| Auxiliary Power | N/A | 1440 | N/A |
| S Exhaust | | | |
| Main Power | N/A | 1413 | N/A |
| Auxiliary Power | N/A | 1413 | N/A |
| S Data Processing | | | |
| Main Power | N/A | 1413 | N/A |
| Auxiliary Power | N/A | 1413 | N/A |
| S Downlink | | | |
| Main Power | N/A | 454 | N/A |
| Auxiliary Power | N/A | 454 | N/A |
| Descent Power | N/A | N/A | N/A |
| Post Landing Power | N/A | N/A | N/A |

- Notes:**
1. The CIR EPCU is designed to allow the use of power from both the Main and Auxiliary buses simultaneously to meet the CIR power requirements if power channelization analysis determines that the CIR power requirements cannot be met by a single bus.
 2. Peak Power is defined as the highest power requirement lasting greater than 50 msec.
 3. These are estimated maximum values based on the worst case BCDCE experiment as of July 16, 2001.
 4. The power characteristics defined assume both Main and Auxiliary feeds can provide power to the CIR simultaneously as described in 3.2.7. The total power drawn by the CIR is the sum of the power drawn individually by the Main and Auxiliary power feeds. CIR can limit the power drawn from the Auxiliary feed to any value dependent upon power available. Based on the values shown above, CIR power allocation for the Auxiliary feed should be set to 12A.

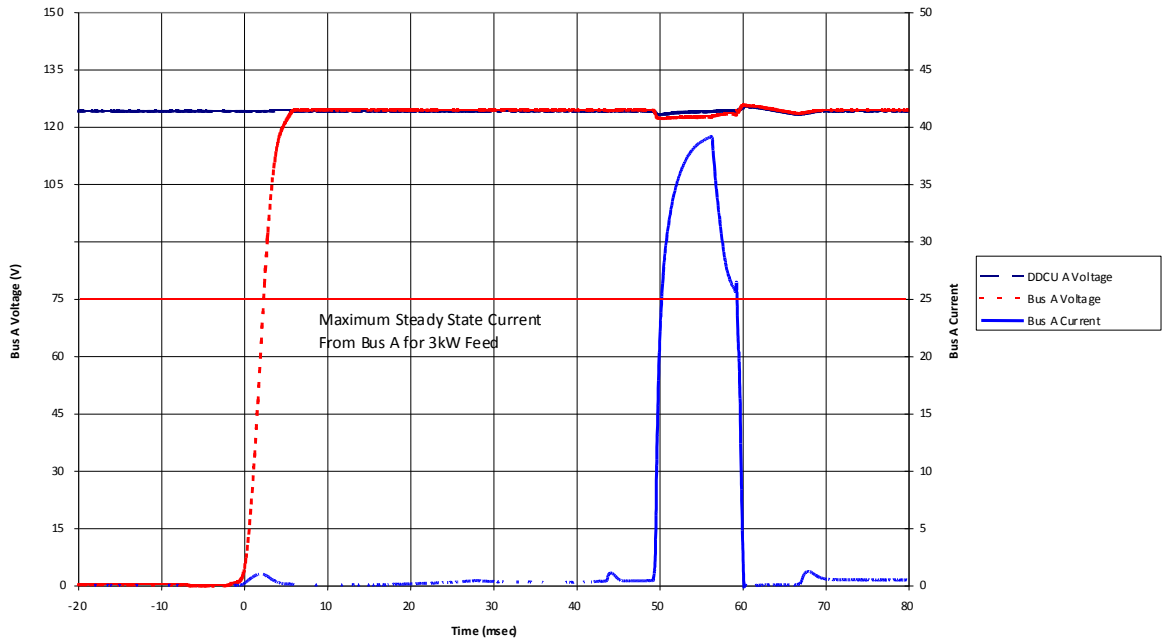


FIGURE 3.2.7-1 COMBUSTION INTEGRATED RACK IN-RUSH CURRENT

Note: The in-rush current shown in Figure 3.2.7-1 represents the current required to charge 2250 μF of filter capacitance on the input side of the 120 Vdc to 28 Vdc DC/DC converters inside the EPCU. This spike represents a worst case configuration with all three EPCU 1 kW converters connected to the same 120 Vdc input bus. The amplitude of this spike could be reduced by 1/3 or 2/3 if one or two of the converters were on the other bus during application of 120 Vdc.

The maximum surge current identified during an automated sequence operation of the subrack payload, MDCA experiment, resulted in a 7.5 A DC transient that lasted for less than 10 ms on the 28 Vdc output from the EPCU. Because of filtering on the 28 Vdc output in the EPCU and the isolation of the EPCU 120 V to 28 V DC/DC converters, this transient was not observed on the 120 Vdc input to the EPCU. The 28 Vdc transient is shown in Figure 3.2.7-2.

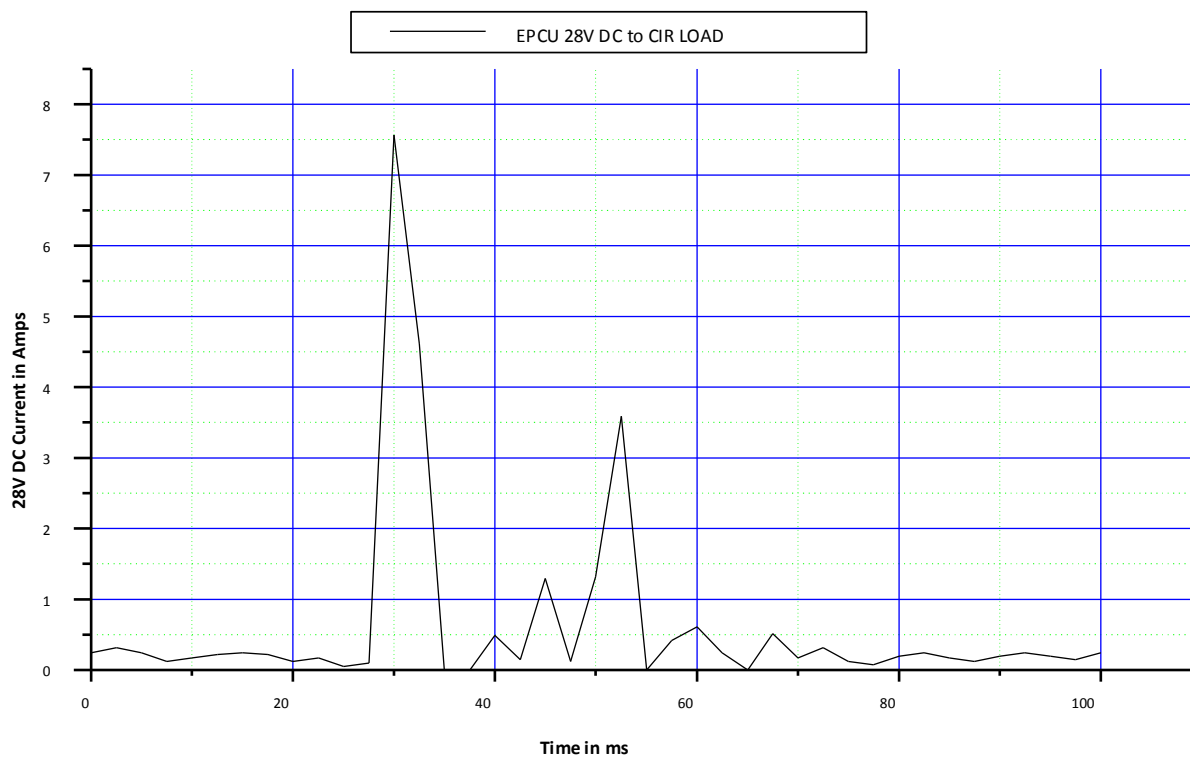


FIGURE 3.2.7-2 COMBUSTION INTEGRATED RACK 28 VDC SURGE CURRENT DURING THE SUBRACK PAYLOAD AUTOMATED SEQUENCE



3.3 COMMAND AND DATA HANDLING INTERFACE REQUIREMENTS

This section applies to all payload commands and data on the Low Rate Data Link (LRDL), Medium Rate Data Link (MRDL), and High Rate Data Link (HRDL) and Multiplexer/Demultiplexer (MDM) supported analog and discrete measurements, including those necessary to interface with the Fire Detection and Suppression System.

3.3.1 GENERAL REQUIREMENTS

The following sections contain descriptions of the unique characteristics of rack data links. The combination of Integrated Data Flow Schematics and details provided in subsequent sections define routing, switching and electrical characteristics as required to perform payload operations and to support link level analysis, test and troubleshooting. CIR internal connectors and cables which require crew interaction for installation or on-orbit operation are also defined by location, connector pin function.

The Integrated Data Flow Schematic for the CIR is provided in Figure 3.3.1-1, Integrated Data Flow Schematic.

The FCF (CIR/FIR) will utilize a SSC for crew status and control of the FCF facilities. The SSC will be utilized to connect, via Ethernet, to FCF embedded web servers within the rack allowing display and command capability on the FCF homepage.

The Next Generation Laptop (NGL)* in the SSC configuration will be utilized for FCF support in the end-to-end configuration as defined in Figure 3.3.1-2, Fluids and Combustion Facility/Station Support Computer End to End Configuration.



Agreements were made through the Payload Software Control Panel and Station Portable Onboard Computer Control Board (S-POCCB). The FCF network connectivity is documented in the Ops Local Area Network (LAN) ICD. FCF will utilize the SSC standard software configuration as defined by the Program. If a software version update is required, a Change Request (CR) will be formally submitted for an SSC client load update. An Input/Output Processor emulator provided by FCF will be used to verify the software interface for flight specific loads.

The NGL, power converter, and all cabling are Program-provided hardware. The Ethernet, video, and video adapter cables will be launched by FCF and dedicated for FCF use. Reference power quality requirements as defined in 57217-NA-0023.

ISSP will provide the following for FCF use on-orbit as shared equipment: NGL (with SSC software load), 28 V DC/DC Converter (SEG33116428), and the power cables (SEG33115374 and SEG39129264-303) that interface with the NGL and the rack.

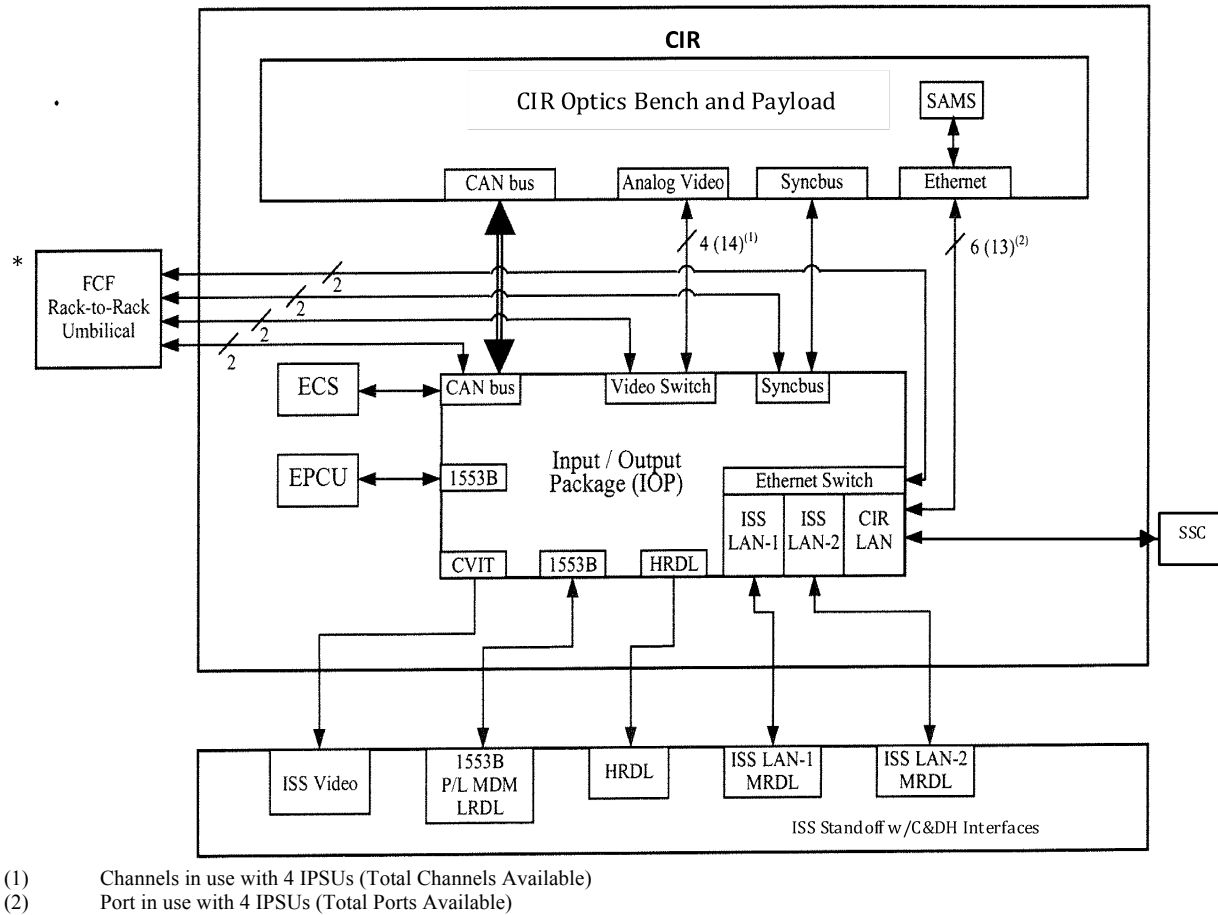
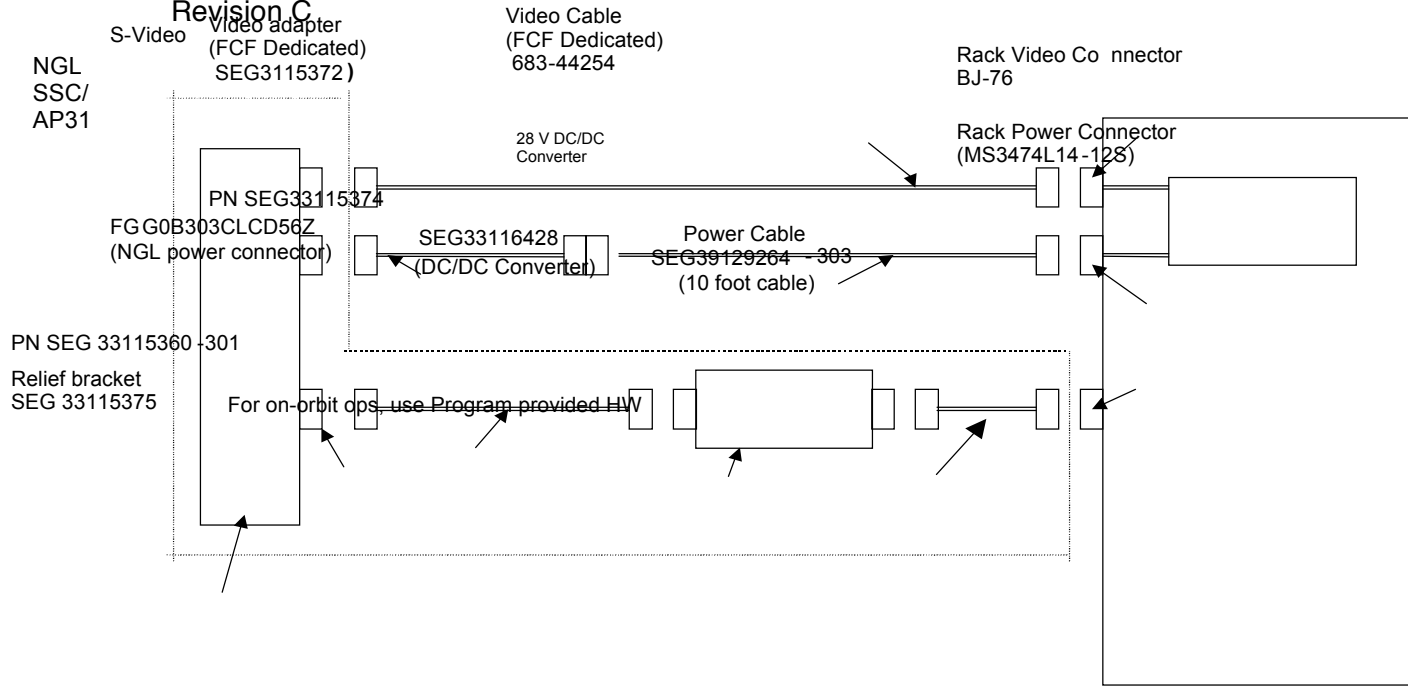


FIGURE 3.3.1-1 INTEGRATED DATA FLOW SCHEMATIC

SSP 57217

Revision C



**FIGURE 3.3.1-2 FLUIDS AND COMBUSTION FACILITY/STATION SUPPORT
COMPUTER END TO END CONFIGURATION**

3.3.2 STANDARD PAYLOAD 1553B LOW RATE DATA LINK

The LRDL electrical interfaces will be in accordance with MIL-STD-1553B, using the interconnection requirements as specified in SSQ 22678.

3.3.2.1 ELECTRICAL INTERFACE

The CIR internal wiring stub length, as defined in MIL-STD-1553B, is listed in Table 3.3.2.1-1, Combustion Integrated Rack Low Rate Data Link Electrical Characteristics.

**TABLE 3.3.2.1-1 COMBUSTION INTEGRATED RACK LOW RATE DATA LINK
ELECTRICAL CHARACTERISTICS**

| | Recommended | Actual |
|--|--------------------|---------------|
| Type | Twisted Shielded | |
| * Stub Length | ≤ 12 Feet | 7 Feet |
| * Measured from the RT to the ISPR Utility Interface Panel | | |

3.3.2.2 CONNECTORS

The CIR 1553B bus connectors to the UIP, J3 and J4, pin assignments are shown in Figure 3.3.2.2-1, Payload 1553B Bus A Connector Pin/Assignment-J3, and Figure 3.3.2.2-2, Payload 1553B Bus B Connector/Pin Assignment-J4, respectively. The MIL-STD-1553B bus connectors are defined in Table 3.1.2-1. The integrated rack 1553B bus connectors to the UOP, J3 and J4, pin assignments are not applicable to the CIR.

| UTILITY I/F PANEL NATC07T15N35SN OR 340105601 B07-15-35SN | | ISPR NATC06G15N35PN (NASA SSQ 21635)* | |
|--|----|--|-------------------------------------|
| 1553 BUS A | | J3 | P3 |
| STANDARD P/L BUS BIT0 ADDRESS (USL) | 1 | 1 | STANDARD P/L BUS BIT0 ADDRESS (USL) |
| STANDARD P/L BUS BIT1 ADDRESS (USL) | 2 | 2 | STANDARD P/L BUS BIT1 ADDRESS (USL) |
| STANDARD P/L BUS BIT2 ADDRESS (USL) | 3 | 3 | STANDARD P/L BUS BIT2 ADDRESS (USL) |
| STANDARD P/L BUS BIT3 ADDRESS (USL) | 4 | 4 | STANDARD P/L BUS BIT3 ADDRESS (USL) |
| STANDARD P/L BUS BIT4 ADDRESS (USL) | 5 | 5 | STANDARD P/L BUS BIT4 ADDRESS (USL) |
| STANDARD P/L BUS PARITY (USL) | 6 | 6 | STANDARD P/L BUS PARITY (USL) |
| STANDARD P/L BUS LOGIC GND (USL) | 7 | 7 | STANDARD P/L BUS LOGIC GND (USL) |
| SPARE | 8 | 8 | Not Used |
| JEM MOD. SPEC. P/L1 BUS BIT0 ADDRESS | 9 | 9 | Not Used |
| JEM MOD. SPEC. P/L1 BUS BIT1 ADDRESS | 10 | 10 | Not Used |
| JEM MOD. SPEC. P/L1 BUS BIT2 ADDRESS | 11 | 11 | Not Used |
| JEM MOD. SPEC. P/L1 BUS BIT3 ADDRESS | 12 | 12 | Not Used |
| JEM MOD. SPEC. P/L1 BUS BIT4 ADDRESS | 13 | 13 | Not Used |
| JEM MOD. SPEC. P/L1 BUS PARITY | 14 | 14 | Not Used |
| JEM MOD. SPEC. P/L1 BUS LOGIC GND | 15 | 15 | Not Used |
| SPARE | 16 | 16 | Not Used |
| JEM MOD. SPEC. P/L3 BUS BIT0 ADDRESS | 17 | 17 | Not Used |
| JEM MOD. SPEC. P/L3 BUS BIT1 ADDRESS | 18 | 18 | Not Used |
| JEM MOD. SPEC. P/L3 BUS BIT2 ADDRESS | 19 | 19 | Not Used |
| JEM MOD. SPEC. P/L3 BUS BIT3 ADDRESS | 20 | 20 | Not Used |
| JEM MOD. SPEC. P/L3 BUS BIT4 ADDRESS | 21 | 21 | Not Used |
| JEM MOD. SPEC. P/L3 BUS PARITY | 22 | 22 | Not Used |
| JEM MOD. SPEC. P/L3 BUS LOGIC GND | 23 | 23 | Not Used |
| SPARE | 24 | 24 | Not Used |
| COL MODULE SPECIFIC P/L BUS A- | 25 | 25 | Not Used |
| COL MODULE SPECIFIC P/L BUS A+ | 26 | 26 | Not Used |
| JEM MODULE SPECIFIC P/L4 1553B BUS A- | 27 | 27 | Not Used |
| JEM MODULE SPECIFIC P/L4 1553B BUS A+ | 28 | 28 | Not Used |
| JEM MODULE SPECIFIC P/L3 1553B BUS A- | 29 | 29 | Not Used |
| JEM MODULE SPECIFIC P/L3 1553B BUS A+ | 30 | 30 | Not Used |
| SPARE | 31 | 31 | Not Used |
| JEM MODULE SPECIFIC P/L2 1553B BUS A- | 32 | 32 | Not Used |
| JEM MODULE SPECIFIC P/L2 1553B BUS A+ | 33 | 33 | Not Used |
| JEM MODULE SPECIFIC P/L1 1553B BUS A- | 34 | 34 | Not Used |
| JEM MODULE SPECIFIC P/L1 1553B BUS A+ | 35 | 35 | Not Used |
| STANDARD P/L 1553B BUS A- (USL) | 36 | 36 | STANDARD P/L 1553B BUS A- (USL) |
| STANDARD P/L 1553B BUS A+ (USL) | 37 | 37 | STANDARD P/L 1553B BUS A+ (USL) |

NOTE: Data buses are controlled impedance twisted shielded pairs with the shield terminated on the connector backshell.

NOTE: JEM module specific P/L bus interfaces are not applicable to the COL.

JEM module specific P/L2, P/L3 and P/L4 bus interfaces are not applicable to the USL.

JEM module specific P/L3 and P/L4 bus interfaces are applicable only to limited locations in the JEM.

COL module specific P/L bus interfaces are not applicable to the JEM and USL.

NOTE: Both the NASA SSQ21635 and ESA SSC3401/056 connectors are intermatable.

NOTE: The bus address logic ground will be connected to the ISPR Remote Terminal logic ground.

*International Payload Buses IP Negotiation Dependent.

FIGURE 3.3.2.2-1 PAYLOAD 1553B BUS A CONNECTOR PIN / ASSIGNMENT - J3

| UTILITY I/F PANEL NATC07T15N35SA OR 340105601B07-15-35SA 1553 BUS B | | ISPR NATC06G15N35PA (NASA SSQ 21635) OR 340105601B06-15-35PA (ESA SSC 3401/056) | |
|---|----|--|---------------------------------|
| | J4 | P4 | |
| COL MOD. SPEC. P/L BUS BIT0 ADDRESS | 1 | 1 | Not Used |
| COL MOD. SPEC. P/L BUS BIT1 ADDRESS | 2 | 2 | Not Used |
| COL MOD. SPEC. P/L BUS BIT2 ADDRESS | 3 | 3 | Not Used |
| COL MOD. SPEC. P/L BUS BIT3 ADDRESS | 4 | 4 | Not Used |
| COL MOD. SPEC. P/L BUS BIT4 ADDRESS | 5 | 5 | Not Used |
| COL MOD. SPEC. P/L BUS PARITY | 6 | 6 | Not Used |
| COL MOD. SPEC. P/L BUS LOGIC GND | 7 | 7 | Not Used |
| SPARE | 8 | 8 | Not Used |
| JEM MOD. SPEC. P/L2 BUS BIT0 ADDRESS | 9 | 9 | Not Used |
| JEM MOD. SPEC. P/L2 BUS BIT1 ADDRESS | 10 | 10 | Not Used |
| JEM MOD. SPEC. P/L2 BUS BIT2 ADDRESS | 11 | 11 | Not Used |
| JEM MOD. SPEC. P/L2 BUS BIT3 ADDRESS | 12 | 12 | Not Used |
| JEM MOD. SPEC. P/L2 BUS BIT4 ADDRESS | 13 | 13 | Not Used |
| JEM MOD. SPEC. P/L2 BUS PARITY | 14 | 14 | Not Used |
| JEM MOD. SPEC. P/L2 BUS LOGIC GND | 15 | 15 | Not Used |
| SPARE | 16 | 16 | Not Used |
| JEM MOD. SPEC. P/L4 BUS BIT0 ADDRESS | 17 | 17 | Not Used |
| JEM MOD. SPEC. P/L4 BUS BIT1 ADDRESS | 18 | 18 | Not Used |
| JEM MOD. SPEC. P/L4 BUS BIT2 ADDRESS | 19 | 19 | Not Used |
| JEM MOD. SPEC. P/L4 BUS BIT3 ADDRESS | 20 | 20 | Not Used |
| JEM MOD. SPEC. P/L4 BUS BIT4 ADDRESS | 21 | 21 | Not Used |
| JEM MOD. SPEC. P/L4 BUS PARITY | 22 | 22 | Not Used |
| JEM MOD. SPEC. P/L4 BUS LOGIC GND | 23 | 23 | Not Used |
| SPARE | 24 | 24 | Not Used |
| COL MODULE SPECIFIC 1553B P/L BUS B- | 25 | 25 | Not Used |
| COL MODULE SPECIFIC 1553B P/L BUS B+ | 26 | 26 | Not Used |
| JEM MODULE SPECIFIC P/L4 1553B BUS B- | 27 | 27 | Not Used |
| JEM MODULE SPECIFIC P/L4 1553B BUS B+ | 28 | 28 | Not Used |
| JEM MODULE SPECIFIC P/L3 1553B BUS B- | 29 | 29 | Not Used |
| JEM MODULE SPECIFIC P/L3 1553B BUS B+ | 30 | 30 | Not Used |
| SPARE | 31 | 31 | Not Used |
| JEM MODULE SPECIFIC P/L2 1553B BUS B- | 32 | 32 | Not Used |
| JEM MODULE SPECIFIC P/L2 1553B BUS B+ | 33 | 33 | Not Used |
| JEM MODULE SPECIFIC P/L1 1553B BUS B- | 34 | 34 | Not Used |
| JEM MODULE SPECIFIC P/L1 1553B BUS B+ | 35 | 35 | Not Used |
| STANDARD P/L 1553B BUS B- (USL) | 36 | 36 | STANDARD P/L 1553B BUS B- (USL) |
| STANDARD P/L 1553B BUS B+ (USL) | 37 | 37 | STANDARD P/L 1553B BUS B+ (USL) |

NOTE: Data buses are controlled impedance twisted shielded pairs with the shield terminated on the connector backshell.

NOTE: JEM module specific P/L bus interfaces are not applicable to the COL.

JEM module specific P/L2, P/L3 and P/L4 bus interfaces are not applicable to the USL.

JEM module specific P/L3 and P/L4 bus interfaces are applicable only to limited locations in the JEM.

COL module specific P/L bus interfaces are not applicable to the JEM and USL.

NOTE: Both the NASA SSQ21635 and ESA SSC3401/056 connectors are intermatable.

NOTE: The bus address logic ground will be connected to the ISPR Remote Terminal logic ground.

FIGURE 3.3.2.2-2 PAYLOAD 1553B BUS B CONNECTOR / PIN ASSIGNMENT - J4

3.3.3 MEDIUM RATE DATA LINK

Umbilical

ISS UIP Receptacle (J46)

Connection at UIP (P46)

3.3.3.1 CONNECTORS

NATC06G11N35PA

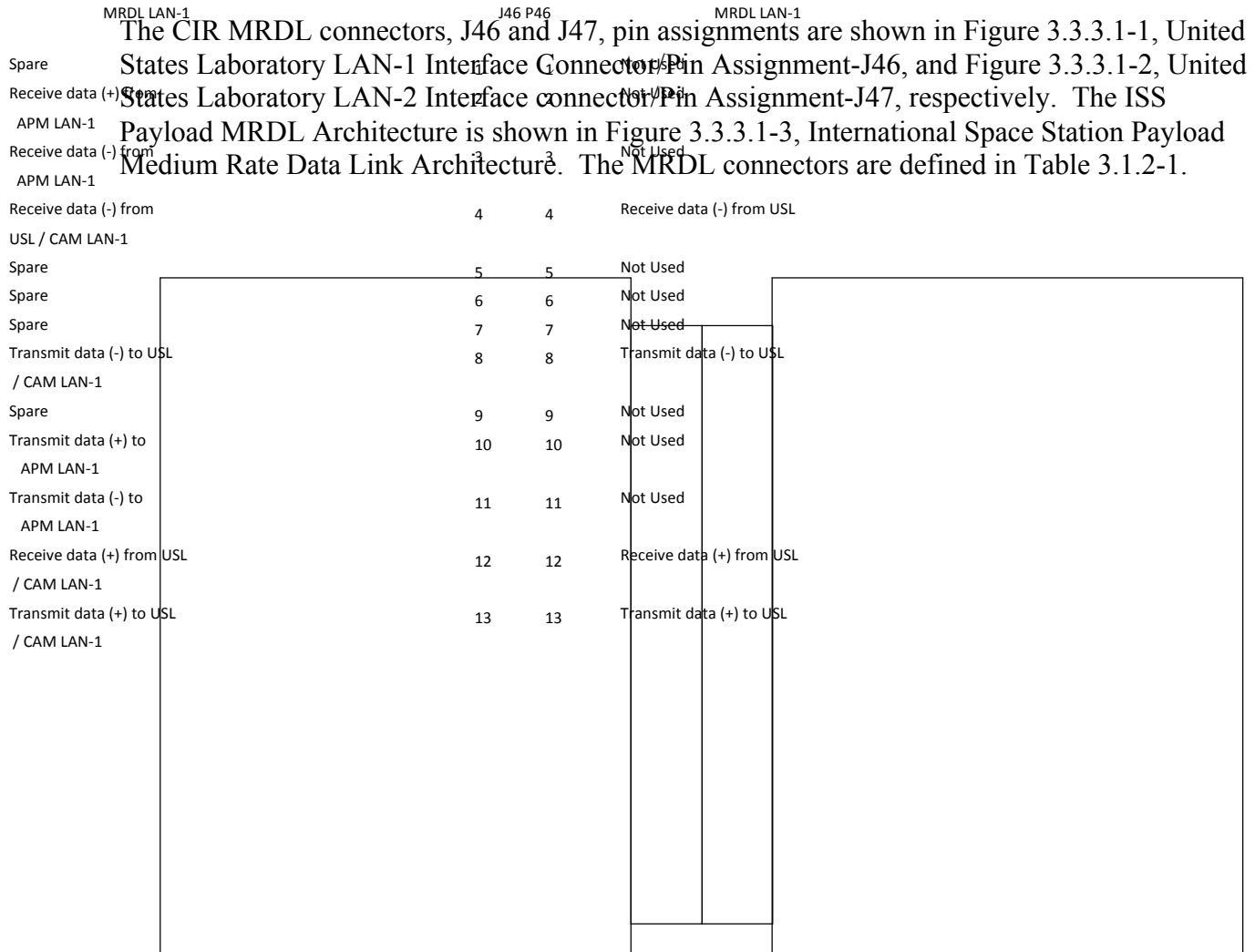


FIGURE 3.3.3.1-1 UNITED STATES LABORATORY LAN-1 INTERFACE CONNECTOR / PIN ASSIGNMENT - J46

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Revision C

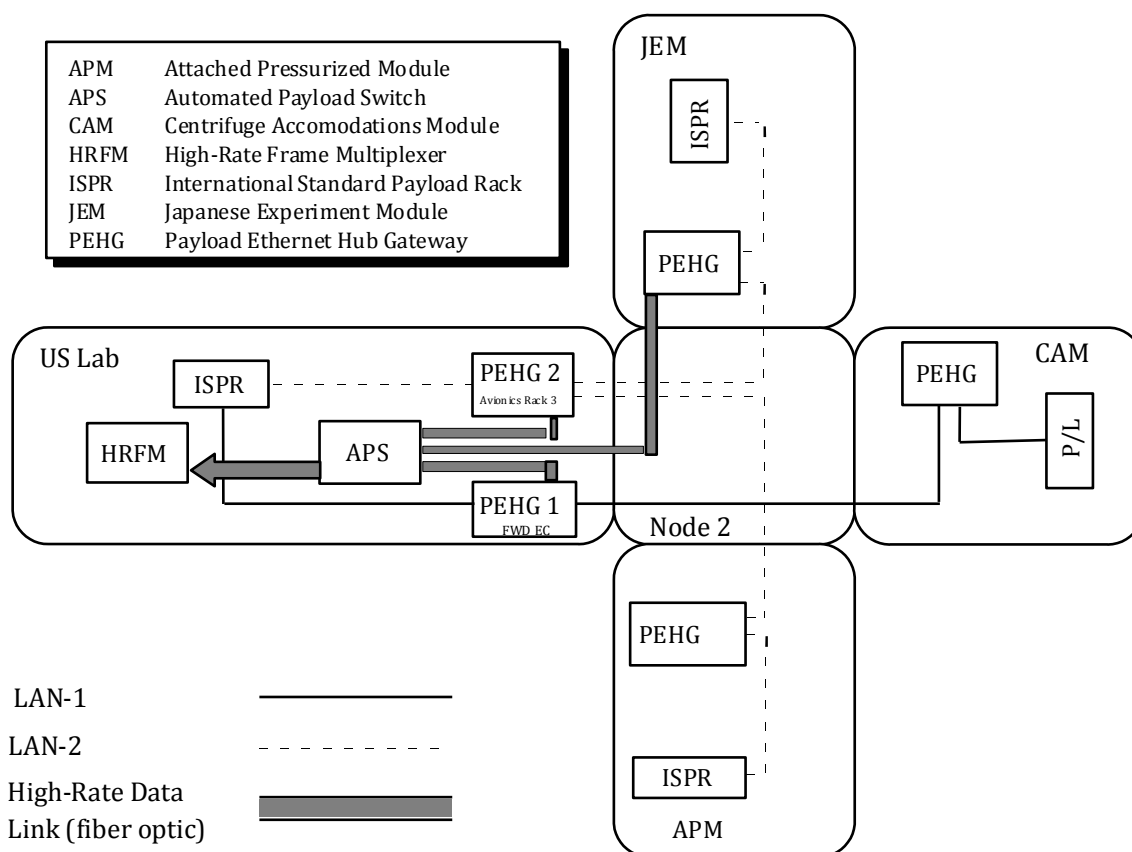
J47 P47

MRDL LAN-2

November 2010

| | | | |
|--|----|----|---------------------------|
| Spare | 1 | 1 | Not Used |
| Receive data (+) from APM LAN-2 | 2 | 2 | Not Used |
| Receive data (-) from APM LAN-2 | 3 | 3 | Not Used |
| Receive data (-) from USL / JEM / APM LAN-2 | 4 | 4 | Receive data (-) from USL |
| Spare | 5 | 5 | Not Used |
| Spare | 6 | 6 | Not Used |
| Spare | 7 | 7 | Not Used |
| Transmit data (-) to USL / JEM / APM LAN-2 | 8 | 8 | Transmit data (-) to USL |
| Spare | 9 | 9 | Not Used |
| Transmit data (+) APM LAN-2 | 10 | 10 | Not Used |
| Transmit data (-) to APM LAN-2 | 11 | 11 | Not Used |
| Receive data (+) from USL / JEM / APM LAN-2 | 12 | 12 | Receive data (+) from USL |
| Transmit data (+) to USL / JEM / APM LAN-2 | 13 | 13 | Transmit data (+) to USL |

**FIGURE 3.3.3.1-2 UNITED STATES LABORATORY LAN-2 INTERFACE
CONNECTOR / PIN ASSIGNMENT - J47**



**FIGURE 3.3.3.1-3 INTERNATIONAL SPACE STATION PAYLOAD
MEDIUM RATE DATA LINK ARCHITECTURE**

3.3.3.2 ELECTRICAL INTERFACE

The CIR internal MRDL wiring stub length is listed in Table 3.3.3.2-1, CIR MRDL Wiring Stub Length.

**TABLE 3.3.3.2-1 COMBUSTION INTEGRATED RACK MEDIUM RATE DATA LINK
WIRING STUB LENGTH**

| | Recommended | Actual |
|--------------|--------------------|---------------|
| Type | Twisted Shielded | |
| Cable Length | ≤ 16.4 feet | 7 Feet |

HIGH RATE DATA LINK

3.3.4

HIGH RATE DATA LINK

HIGH RATE DATA LINK

3.3.4.1 CONNECTOR

The CIR HRDL connector, J7, pin assignments are shown in Figure 3.3.4.1-1, Standard High Rate Data Connector Part Number and Pin Assignment-J7. The HRDL bus connector is defined in Table 3.1.2-1.

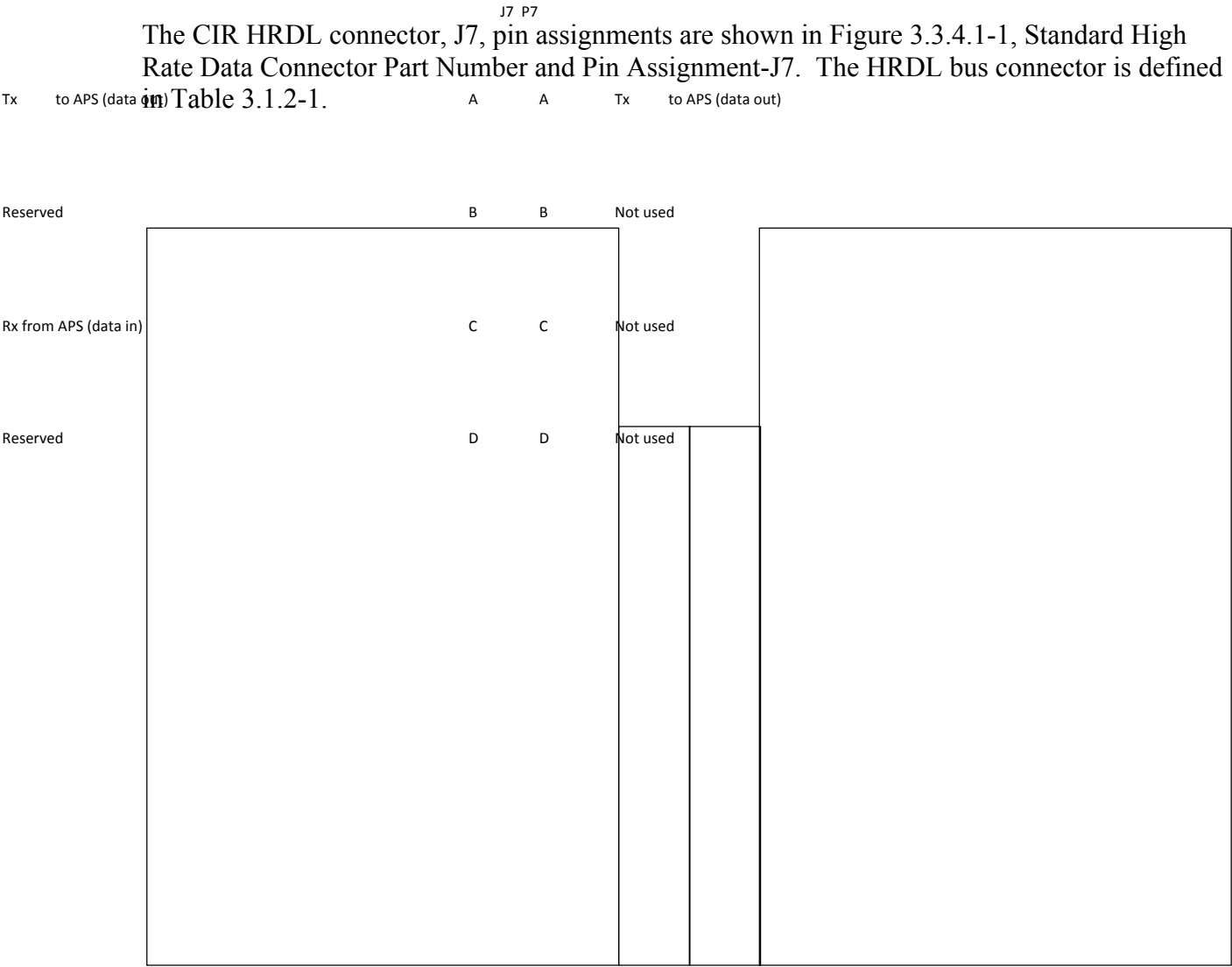


FIGURE 3.3.4.1-1 STANDARD HIGH RATE DATA CONNECTOR
PART NUMBER AND PIN ASSIGNMENT - J7

3.3.4.2 FIBER OPTIC SIGNAL CHARACTERISTICS

The CIR Fiber Optic signal power at the HRDL J7 interface is: 14.05 dBm.

3.3.5 FIRE DETECTION SYSTEM / POWER SWITCH INTERFACE

3.3.5.1 CONNECTOR

The CIR fire detection support and Rack Power Switch signals connector, J43, pin assignments are shown in Figure 3.3.5.1-1, Combustional Integrated Rack Power Removal Switch/Fire Detection Support Interface Connector/Pin Assignments-J43. The fire detection support and power removal switch connector is defined in Table 3.1.2-1.

| ISS UIP NATC07T13N35SA | J43 | P43 | ISPR NATC06G13N35PA |
|---|-----|-----|---|
| MAINT. SWITCH / FIRE DETECTION SUPPORT INTERFACE | | | MAINT. SWITCH / FIRE DETECTION SUPPORT INTERFACE |
| Smoke Detection Scatter (-) | 1 | 1 | Smoke Detection Scatter (-) |
| Spare | 2 | 2 | Not Used |
| Spare | 3 | 3 | Not Used |
| Spare | 4 | 4 | Not Used |
| Spare | 5 | 5 | Not Used |
| Spare | 6 | 6 | Not Used |
| Spare | 7 | 7 | Not Used |
| Spare | 8 | 8 | Not Used |
| Spare | 9 | 9 | Not Used |
| Spare | 10 | 10 | Not Used |
| Spare | 11 | 11 | Not Used |
| Fan Ventilation Indicator (+) | 12 | 12 | Fan Ventilation Indicator (+) |
| Fan Ventilation Indicator (-) | 13 | 13 | Fan Ventilation Indicator (-) |
| Smoke Detection Scatter (+) | 14 | 14 | Smoke Detection Scatter (+) |
| Smoke Indicator Command (-) | 15 | 15 | Smoke Indicator Command (-) |
| Smoke Detection Obscuration (+) | 16 | 16 | Smoke Detection Obscuration (+) |
| Smoke Detection Obscuration (-) | 17 | 17 | Smoke Detection Obscuration (-) |
| Smoke Detection Bit Enable (-) | 18 | 18 | Smoke Detection Bit Enable (-) |
| Power Removal Switch Position (-) | 19 | 19 | Power Removal Switch Position (-) |
| Power Removal Switch Position (+) | 20 | 20 | Power Removal Switch Position (+) |
| Smoke Indicator Command (+) | 21 | 21 | Smoke Indicator Command (+) |
| Smoke Detection Bit Enable (+) | 22 | 22 | Smoke Detection Bit Enable (+) |

**FIGURE 3.3.5.1-1 COMBUSTIONAL INTEGRATED RACK POWER REMOVAL SWITCH /
FIRE DETECTION SUPPORT INTERFACE CONNECTOR / PIN ASSIGNMENTS - J43**

3.3.5.2 SMOKE SENSOR CIRCUIT CHARACTERISTICS

The interface for the CIR smoke detector is as depicted in the simplified schematic of Figure 3.3.5.2-1, Principle Circuit for the Smoke Sensor Interface. CIR smoke detector functional characteristics are shown in Table 3.3.5.2-1, Smoke Detection Support Functional Characteristics.

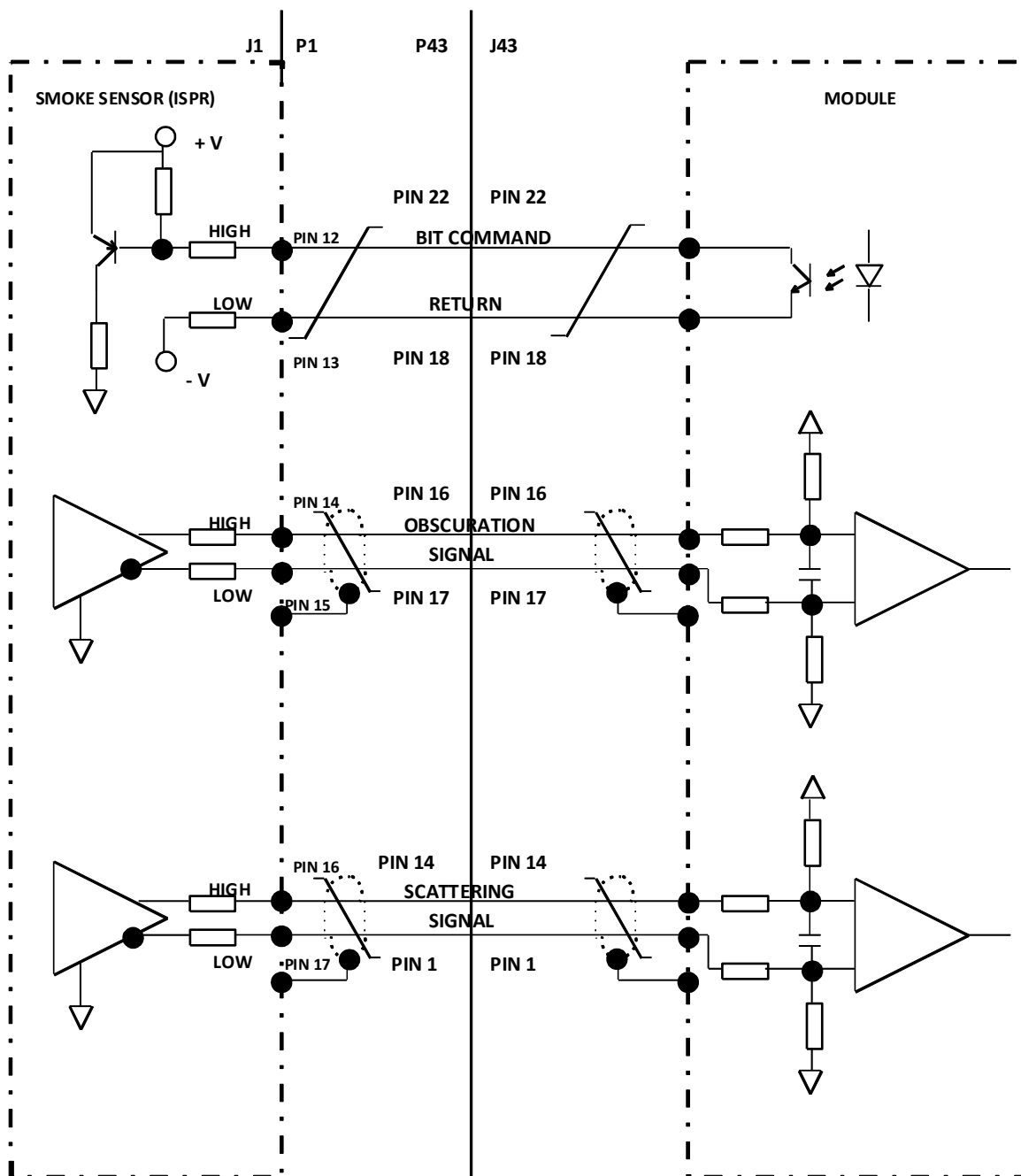


FIGURE 3.3.5.2-1 PRINCIPLE CIRCUIT FOR THE SMOKE SENSOR INTERFACE

TABLE 3.3.5.2-1 SMOKE DETECTION SUPPORT FUNCTIONAL CHARACTERISTICS

| TYPE | SIGNAL NAME | SIGNAL TYPE | CONDITION | SIGNAL RANGE | VOLTAGE RANGE (SIGNAL RANGE) NOMINAL |
|-----------------|--------------------|-------------|------------------------|-----------------------------|--------------------------------------|
| Smoke Detector | BIT input | Discrete | Nominal | Open (high) | V= +5.0 Vdc |
| Smoke Detector | BIT input | Discrete | BIT ON | Closed (low) | V< +5.0 Vdc |
| Smoke Detector | Obscuration Output | Analog | Nominal | 0 to 100% light attenuation | V= +4 to -4 Vdc |
| Smoke Detector | Obscuration Output | Analog | BIT ON | Laser OFF | V< -3.8 Vdc |
| Smoke Detector | Scatter output | Analog | Nominal | 0 to 2% OBS/ ft | 0 to 4.5 Vdc |
| Smoke Detector | Scatter output | Analog | BIT ON | 0.9 to 2.1 % OBS/ ft | 1.8 to 4.2 Vdc |
| Smoke Detector | Scatter output | Analog | BIT Off (Quiet Period) | 0% OBS/ ft | 0 to 0.5 Vdc |
| FAN Ventilation | Ventilation output | Analog | Nominal | +/- 5 Vdc | +/- 5 Vdc |
| Smoke Indicator | Indication input | Discrete | N/ A | N/ A | N/ A |

The rack air flow threshold voltage for smoke-detection is 0.5 Vdc.

The circuit diagram for the fan ventilation and smoke indicator LED is shown in Figure 3.3.5.2-3, Fan Ventilation and Smoke Indicator Light-Emitting Diode Circuit.

The fan speed signal versus the air flow across the rack smoke sensor is shown in Figure 3.3.5.2-2, Fan Speed vs. Sensor Voltage.

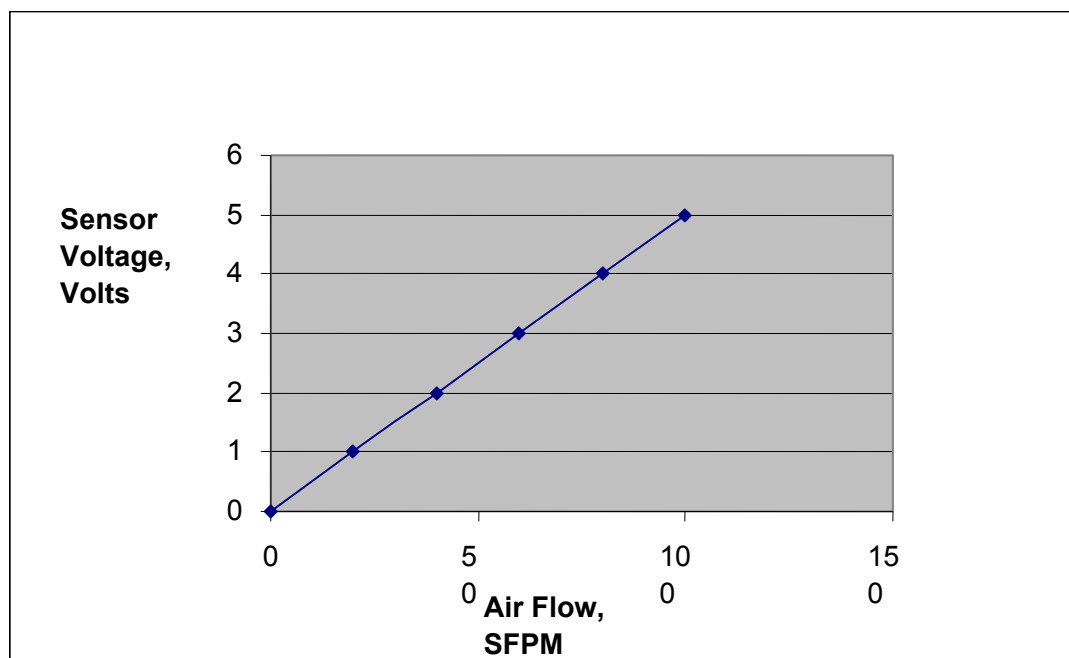
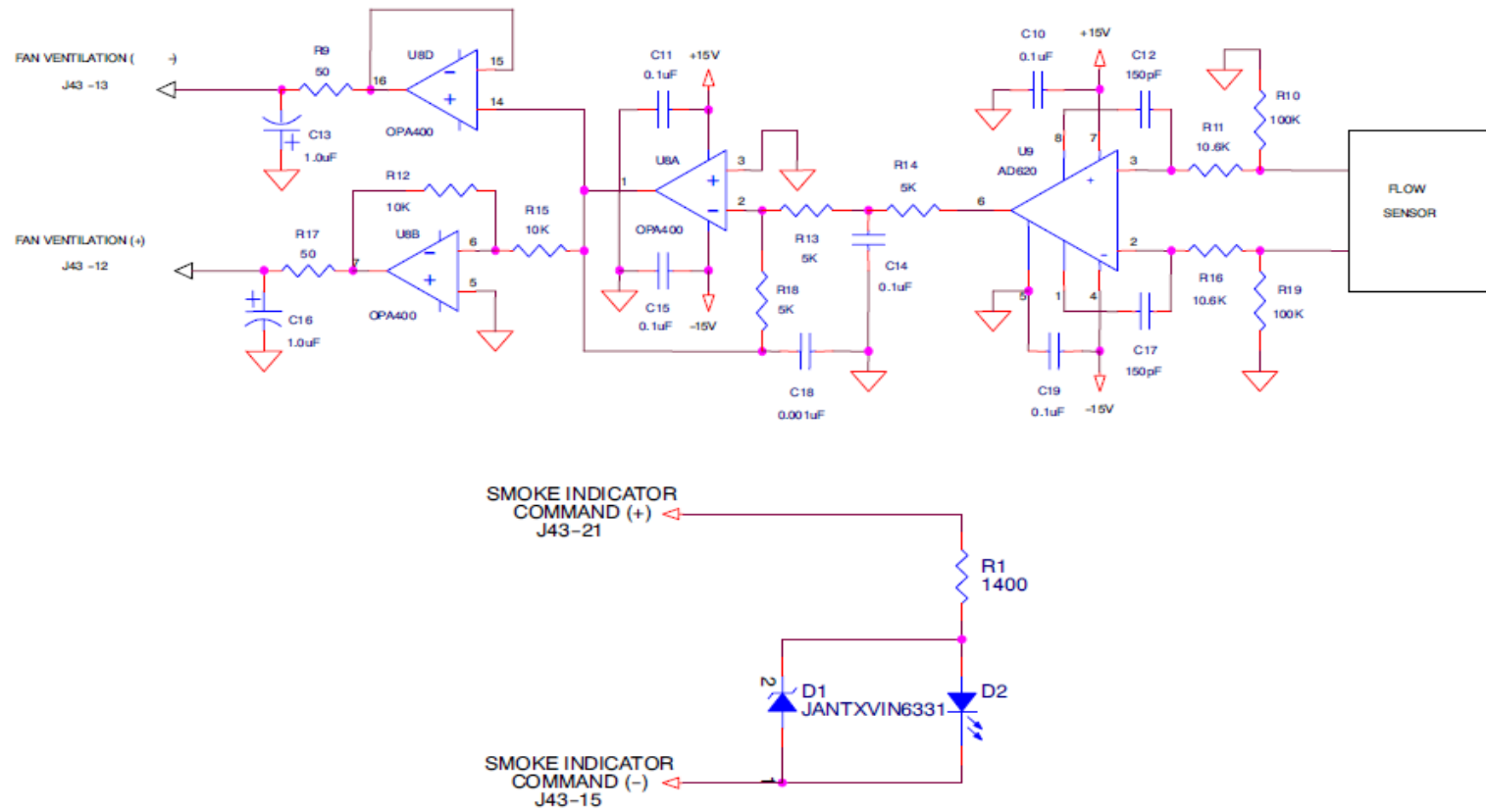


FIGURE 3.3.5.2-2 FAN SPEED VS. SENSOR VOLTAGE

FIGURE 3.3.5.2-3 FAN VENTILATION AND SMOKE INDICATOR LIGHT-EMITTING DIODE CIRCUIT



3.3.5.3 RACK POWER SWITCH CIRCUIT CHARACTERISTICS

The USL provides, at each ISPR location, one switch closure command line for switching off the main/auxiliary power feeds implemented at the J43 connector. The interface for the Rack Power Switch is depicted in the simplified schematic in Figure 3.3.5.3-1, Rack Power Switch Interface.

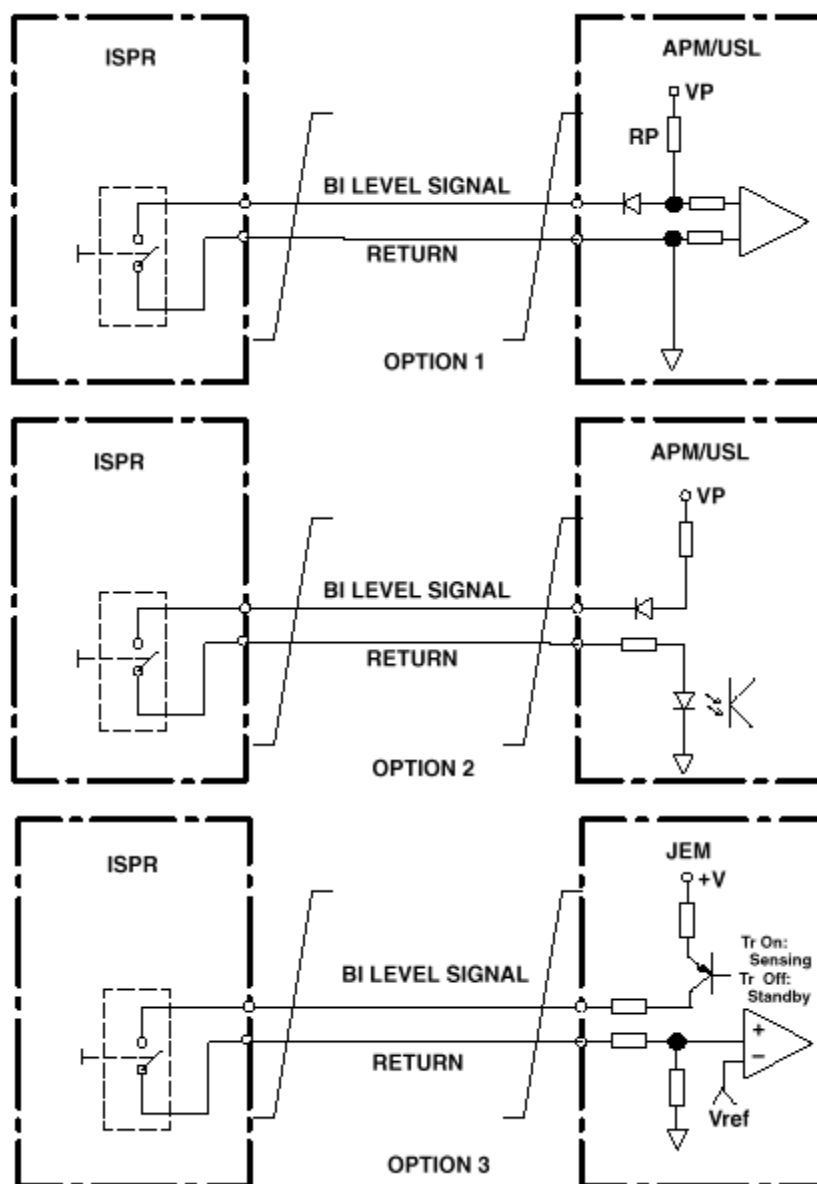


FIGURE 3.3.5.3-1 RACK POWER SWITCH INTERFACE

DC Power Cable (DC Power) position closes the circuit on J43, pin 19 & 20. When the circuit on J43, pin 19 & 20 is closed, the RPC is commanded open which initiates the removal of power for a specific ISPR location. In the USL, DOWN (On) position opens the circuit on J43, pin 19 and 20. When the circuit on J43, pin 19 & 20 is open, it removes the inhibit that prevents the RPC from restoring power to the rack. However, the RPC must be commanded on (closes RPC) again, either by the ground or by the crew.

Chassis Ground

+ 28.0 VDC
+ 28.0 VRTN

L
J

L
J

Chassis Ground

+ 28.0 VDC
+ 28.0 VRTN

Note: For Rack Power Switch (RPS) functionality, refer to SSP 57020 Rev. A.

3.3.6 PAYLOAD LAPTOP CONNECTIONS

The CIF/FCF utilizes the ISSP provided SSC for command and control of the facility. Reference paragraph 3.3.1.

The CIR Power, Ethernet, and Video pin assignments are shown in Figure 3.3.6-1, Power Cable Pin Assignments, Figure 3.3.6-2, Video Wire Harness Pin Assignments, and Figure 3.3.6-3, Ethernet Wire Harness Pin Assignments.

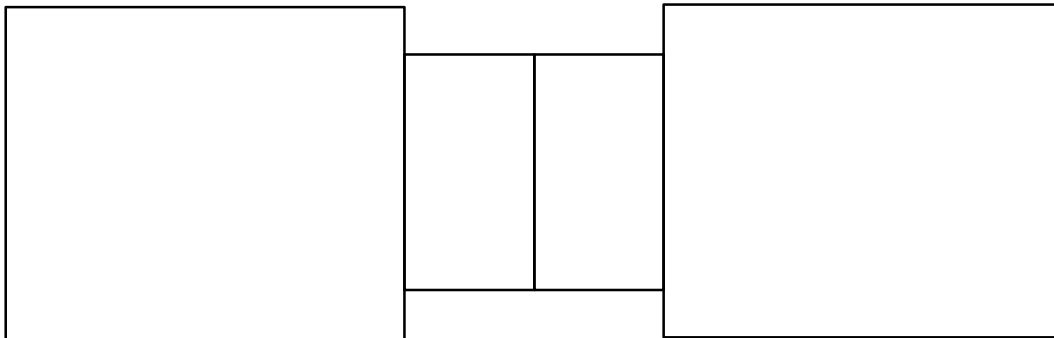


FIGURE 3.3.6-1 POWER CABLE PIN ASSIGNMENTS

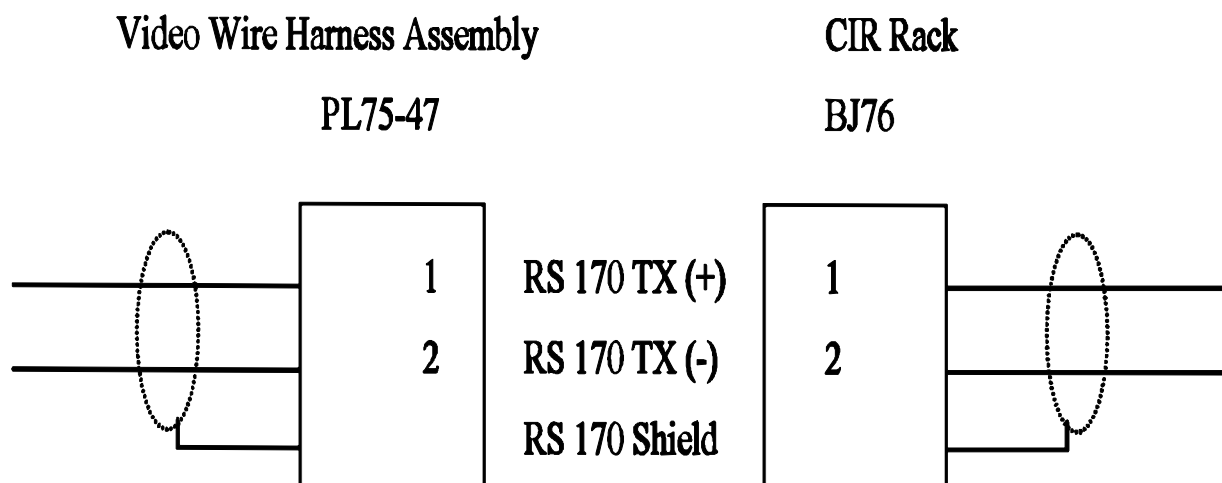


FIGURE 3.3.6-2 VIDEO WIRE HARNESS PIN ASSIGNMENTS

| Ethernet Wire Harness Assembly | | CIR Rack | |
|--------------------------------|----|----------------|-----------------------|
| MS27467T11F35P | | MS27468T11F35S | |
| Ethernet Receive (+) | 3 | 3 | Ethernet Receive (+) |
| Ethernet Receive (-) | 4 | 4 | Ethernet Receive (-) |
| Ethernet Transmit (+) | 1 | 1 | Ethernet Transmit (+) |
| Ethernet Transmit (-) | 2 | 2 | Ethernet Transmit (-) |
| Not Connected | 5 | 5 | Not Connected |
| Not Connected | 6 | 6 | Not Connected |
| Not Connected | 7 | 7 | Not Connected |
| Not Connected | 8 | 8 | Not Connected |
| Not Connected | 9 | 9 | Not Connected |
| Not Connected | 10 | 10 | Not Connected |
| Not Connected | 11 | 11 | Not Connected |
| Not Connected | 12 | 12 | Not Connected |
| Not Connected | 13 | 13 | Not Connected |

FIGURE 3.3.6-3 ETHERNET WIRE HARNESS PIN ASSIGNMENTS

3.4 PAYLOAD VIDEO INTERFACE REQUIREMENTS

This section is limited to internal video interfaces. The USL provides a fiber optic video interface. The MPLM does not have video.

3.4.1 NATIONAL TELEVISION SYSTEMS COMMITTEE FIBER OPTIC VIDEO

3.4.1.1 PULSE FREQUENCY MODULATION NTSC FIBER OPTIC VIDEO CHARACTERISTICS

The Pulse Frequency Modulation (PFM) fiber optical video interface consists of one video channel into the rack, one video channel out of the rack, and one synchronization and control channel. The video hard wired addresses are allocated in Table 3.4.2.1-1.

3.4.1.2 PULSE FREQUENCY MODULATION NATIONAL TELEVISION SYSTEMS COMMITTEE OPTICAL CONNECTOR

The CIR PFM National Television Systems Committee (NTSC) video optical connector, J16 pin assignments are shown in Figure 3.4.1.2-1, Optical Video Connector/Pin Assignment. The location of the video optical connector, J16, interface at the UIP is defined in Figures 3.1.2-1 and 3.1.2-2. The video optical connector is defined in Table 3.1.2-1.

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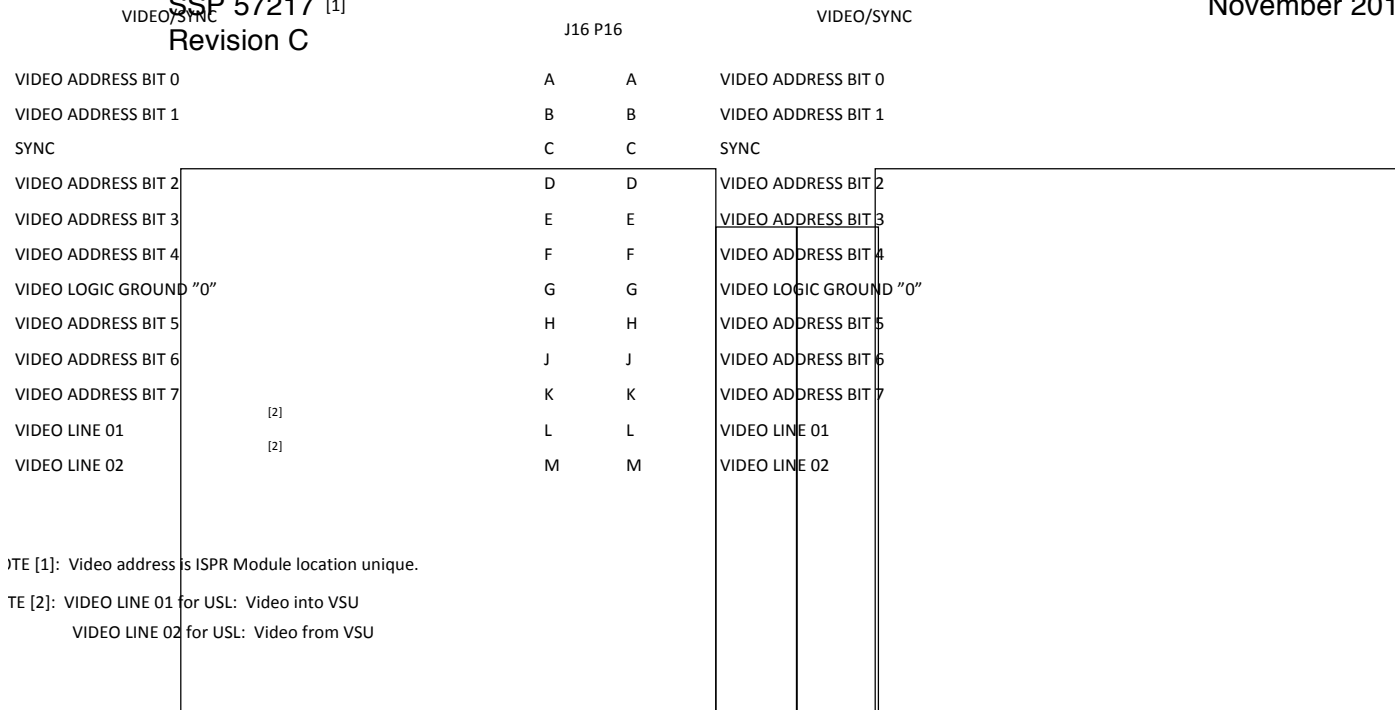


FIGURE 3.4.1.2-1 OPTICAL VIDEO CONNECTOR / PIN ASSIGNMENT - J16

3.4.2 NATIONAL TELEVISION SYSTEMS COMMITTEE ELECTRICAL VIDEO INTERFACES

The CIR does not utilize JEM interfaces; thus the electrical video interfaces do not apply.

3.4.2.1 ELECTRICAL VIDEO CONNECTOR

The location of the electrical video connector, J77, interfaces at the UIP are defined in Figures 3.1.2-3 and 3.1.2-4. The electrical video connector is defined in Table 3.1.2-1. The video hardwired addresses are allocated in Table 3.4.2.1-1.

**TABLE 3.4.2.1-1 VIDEO HARDWIRED ADDRESSES
(2 PAGES)**

| USL ISPR | |
|-------------|-------------------------|
| Location | Video Hardwired Address |
| LAC1 | 179 |
| LAC2 | 180 |
| LAC3 | 181 |
| LAC4 | 182 |
| LAC5 | 183 |
| LAS1 | 184 |
| LAS2 | 185 |

**TABLE 3.4.2.1-1 VIDEO HARDWIRED ADDRESSES
(2 PAGES)**

| USL ISPR | |
|---------------------|-----|
| LAS3 | 186 |
| LAS4 | 187 |
| LAF3 | 188 |
| LAP1 | 189 |
| LAP2 | 190 |
| LAP4 | 191 |

Notes:

1. Decimal values to be mapped in 8 bit presentation, bit 0 = LSB. See Figure 3.4.1.2-1.
2. Jumpering address line to ground = logic 0.

3.5 THERMAL CONTROL INTERFACE REQUIREMENTS

3.5.1 INTERNAL THERMAL CONTROL SYSTEM INTERFACE REQUIREMENTS

A schematic of the CIR coolant loop is provided in Figure 3.5.1.2-1, CIR Fluid Loop Schematic.

3.5.1.1 CONNECTOR

The location of the Internal Thermal Control System (ITCS) Moderate Temperature Loop (MTL) interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The MTL connectors are defined in Table 3.1.2-1. The CIR does not utilize the Low Temperature Loop (LTL) interfaces.

3.5.1.2 INTERNAL THERMAL CONTROL SYSTEM COOLANT FLOW RATE AND PRESSURE DROP

The CIR can request to be supplied a specific flow rate within the ranges specified in Table 3.5.1.2-1, Internal Thermal Control System Coolant Flow Rate Capability. Multiple flow rate settings can be accommodated, provided the control system time constant requirements are met and the flow rate setting changes are properly coordinated with the Module Integrator. Each payload utilizing a module-provided valve has an off or “zero flow” capability.

The CIR contains two ITCS flow control devices, Water Flow Control Assemblies (WFCA), that will be used to control the flow within a CIR allocation. The WFCA is shown in Figure 3.5.1.2-1, Combustion Integrated Rack Fluid Loop Schematic. Each WFCA is capable of controlling the flow of coolant through the CIR within the range of 25 to 525 \pm 3%. The WFCA will control flow so that a maximum flow rate of 430 lb/hr is not exceeded.* The maximum pressure drop across the CIR for the MTL is defined in Figure 3.5.1.2-2, United States Laboratory Available Pressure Drop vs. Flow Rate. The coolant flow rate required by the CIR and the corresponding pressure drop across the rack is defined in Figure 3.5.1.2-3, Combustion Integrated Rack Pressure Drop vs. Flow Rate.

**TABLE 3.5.1.2-1 INTERNAL THERMAL CONTROL SYSTEM COOLANT
FLOW RATE CAPABILITY**

| Element | System Control Capability | Moderate Temperature Loop | |
|----------------------------------|---|-----------------------------|---------------------------------------|
| | | lb/hr (kg/hr) | lb/hr (kg/hr) |
| | | Module Total | Available at single P/L Location |
| USL ^[2] (Post 20A) | $\pm 5\% > 350$ lb/hr $\pm 10\% < 350$ lb/hr | 1050 (476) | 100-900 ^[3] * 45-408 |
| USL ^[2] (Pre 20A) | $\pm 5\% > 350$ lb/hr $\pm 10\% < 350$ lb/hr | 700 ^[1] (317) | 100-700 ^{[1][3]} * 45-317 |

Notes:

- [1] The airlock requires 350 lb/hr (159 kg/hr) of USL MTL prior to the arrival of Node 3 of Flight 20A. Flow rates greater than 700 lb/hr may be available when the airlock is in Housekeeping mode. Use of this additional flow must be pre-coordinated with the Thermal Control Systems Team.
- [2] The total flow indicated available for payloads assumes the USL MTL pump is providing a total flow of 3200 lb/hr (1451 kg/hr).
- [3] During nominal CIR operations, the WFCA will control flow so that a maximum flow rate of 430 lb/hr is not exceeded.*

* This condition represents an exception to requirements found in SSP 57000, paragraphs 3.5.1.6.A, B. Refer to 57217-NA-0011. Table 5.2.2-1 provides the status of all exceptions.

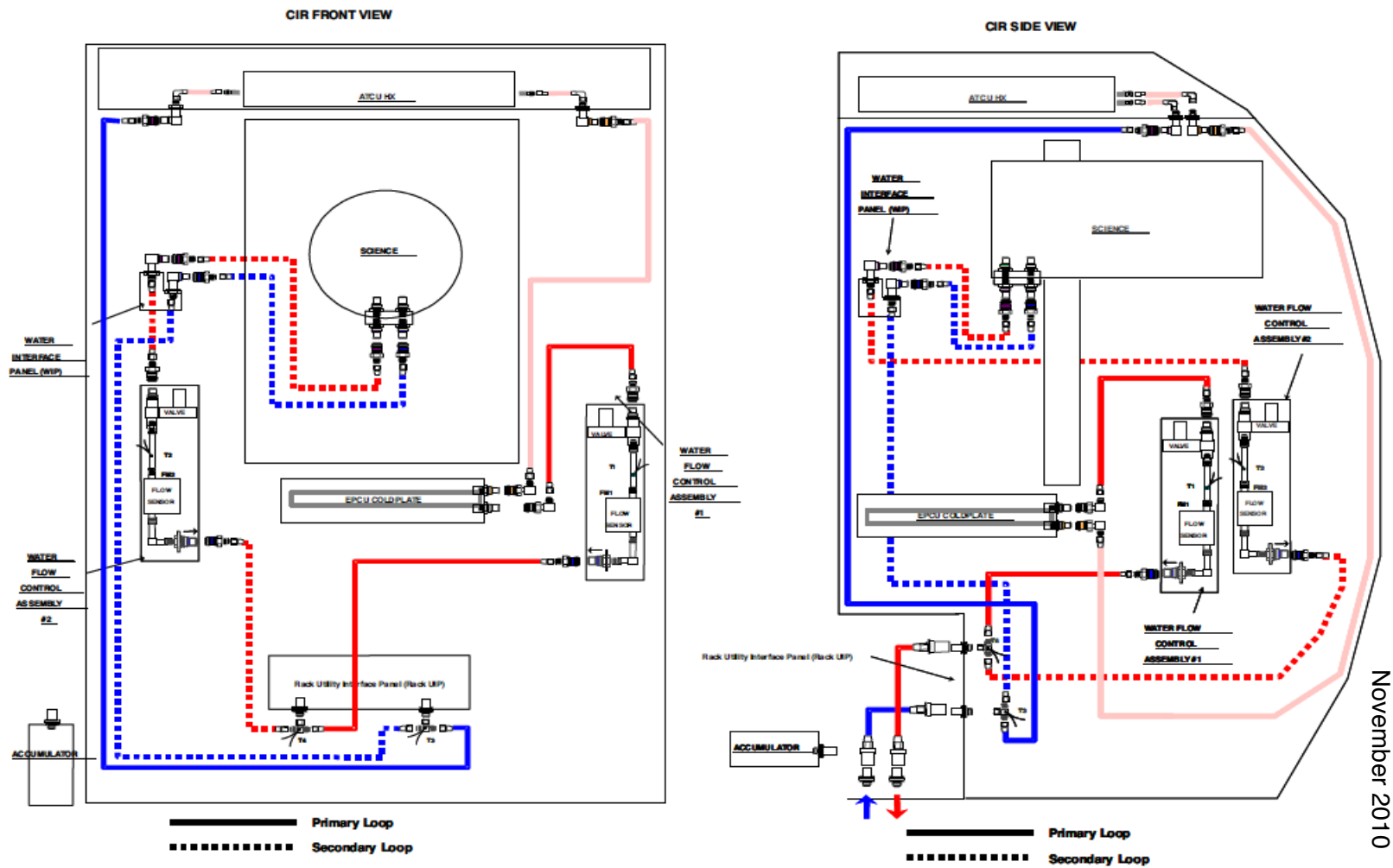


FIGURE 3.5.1.2-1 COMBUSTION INTEGRATED RACK FLUID LOOP SCHEMATIC

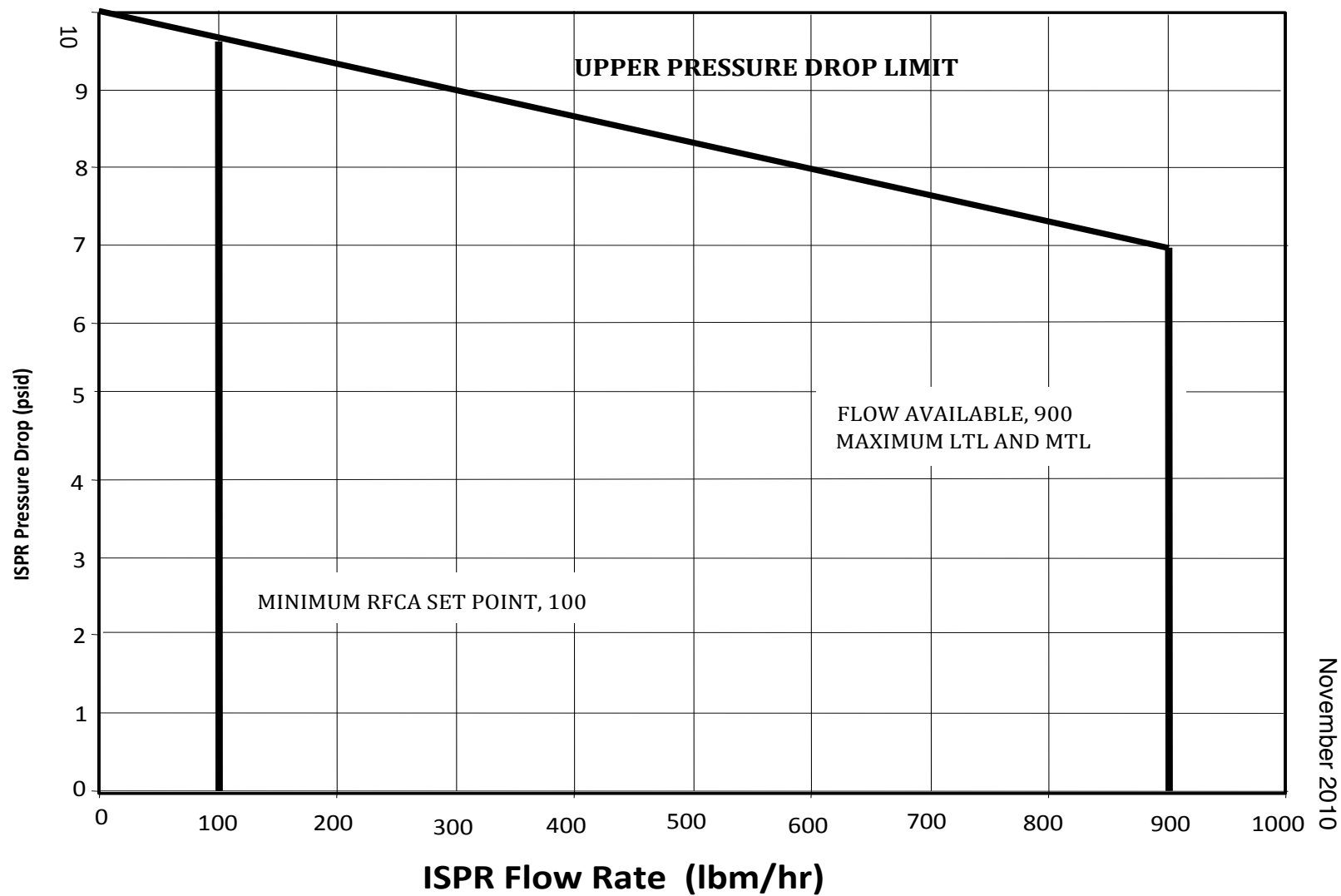
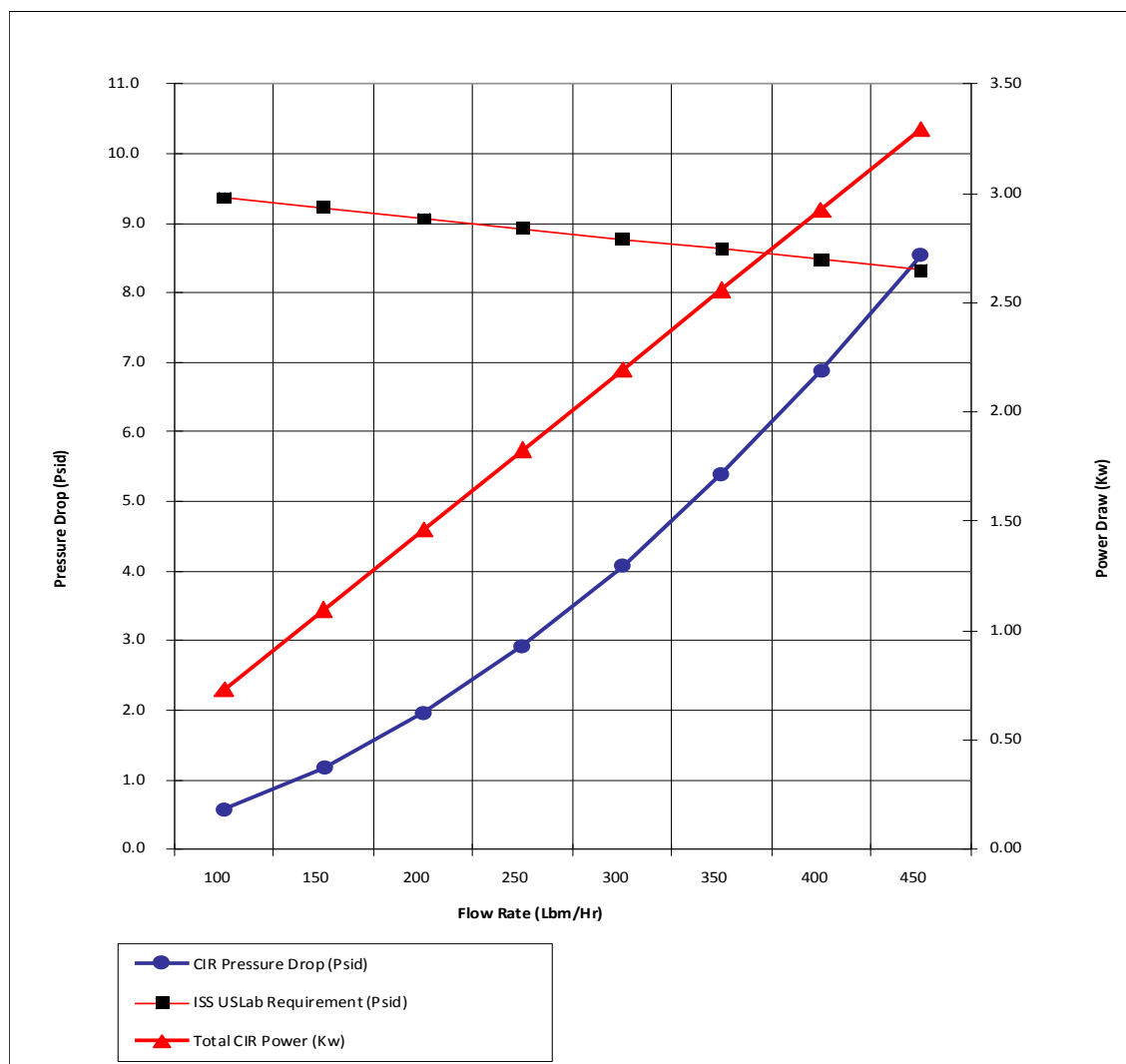


FIGURE 3.5.1.2-2 UNITED STATES LABORATORY AVAILABLE PRESSURE DROPS VS. FLOW RATE



**FIGURE 3.5.1.2-3 COMBUSTION INTEGRATED RACK
PRESSURE DROP VS. FLOW RATE**

3.5.1.3 COOLANT SUPPLY TEMPERATURE

The ITCS coolant loop supply temperatures in the USL MTL are 61°-65° F (16°-18.3° C).

The CIR does not utilize the MPLM coolant interfaces.

3.5.1.4 DELETED

3.5.1.5 SIMULTANEOUS COOLING

The CIR does not utilize the LTL coolant interface; thus simultaneous cooling will not be utilized.

3.5.1.6 INTEGRATED RACK COOLANT QUANTITY

The maximum total water volume available for payload use from the MTL in the USL is 42.25 gallons (159.9 liters). The quantity of coolant contained in the CIR is 1.8 gallons (6.6 liters).

3.5.1.7 INTEGRATED RACK FLUID THERMAL EXPANSION

The CIR will provide compensation for thermal expansion of the ITCS cooling fluid in its cooling system in accordance with SSP 57000, Paragraph 3.5.1.2. A removable accumulator is identified in the CIR ITCS schematic shown in Figure 3.5.1.2-1.

3.5.1.8 CABIN AIR HEAT LOADS

The total cabin air sensible heat load for the USL is defined in Table 3.5.1.8-1. The CIR cabin air sensible heat load is provided in Table 3.5.1.8-1. The total cabin air latent heat load for each module is defined in Table 3.5.1.8-2. The CIR cabin air latent heat load is provided in Table 3.5.1.8-2.

TABLE 3.5.1.8-1 CABIN AIR SENSIBLE HEAT LOAD

| USL Limit | Heat Transferred from the CIR to the Cabin Air |
|------------------|---|
| 500 W | 60 W |

Note: Total integrated rack sensible heat load. The heat load includes integrated rack sensible heat leak, all associated ancillary provided equipment even if it is not directly connected to the rack. The ISS SSC loads are not included.

TABLE 3.5.1.8-2 CABIN AIR LATENT HEAT LOAD

| USL Limit | CIR LOAD |
|------------------|-----------------|
| 70 W | 0 W |

3.5.1.9 MPLM CABIN AIR COOLING

The CIR does not operate in the MPLM.

3.6 VACUUM SYSTEM REQUIREMENTS

3.6.1 VACUUM EXHAUST SYSTEM /WASTE GAS SYSTEM

The VES/WGS is capable of reaching a pressure at the ISPR interface of 1×10^{-3} torr (0.13 Pa) in less than two hours for a single payload/facility volume of 100 liters or less than 3.5 hrs for 250 liters at an initial pressure of 14.7 psia (101 kPa); dry air at 70° F (21° C) assuming zero leakage and out/offgasing and infinite conductivity between payload/facility volume and the rack interface. The ISPR locations in the USL providing VES/WGS capabilities are illustrated in Figure 3.6.1-1, United States Laboratory Vacuum Exhaust System/Waste Gas System Interface Locations. The location of the VES/WGS interface at the UIP is defined in Figures 3.1.2-1 and 3.1.2-2. The VES/WGS connector is defined in Table 3.1.2-1.

A simplified schematic of the CIR vacuum system is provided in Figure 3.7-1, Combustion Integrated Rack Pressurized Gas Schematic, (Sheet 2 of 2).

3.6.1.1 ACCEPTABLE EXHAUST GASES

A list of acceptable exhaust gases with verified compatibility to the VES/WGS wetted materials is documented in Appendix D of SSP 57000. The proposed CIR vent gases are identified in Table 3.6.1.1-1, Combustion Integrated Rack Vent Gases.

A simplified schematic of the CIR vacuum system is provided in Figure 3.7-1 (Sheet 2 of 2).

Contingency events are defined as unplanned uses of the VES to expel gases which have not fully combusted. CIR will list constituents that will be exhausted after scrubbing and/or dilution for such an event. These gases must be compatible with the VES.

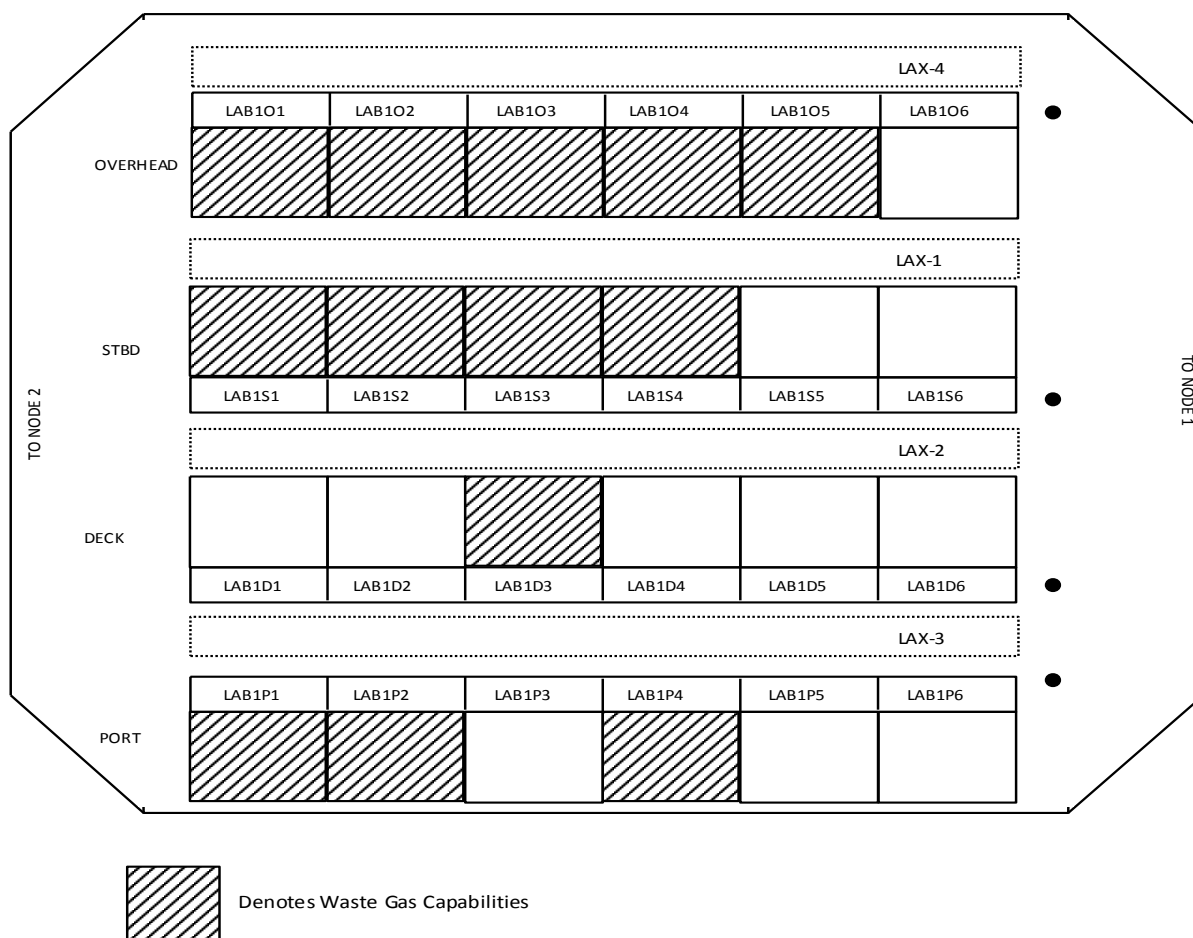


FIGURE 3.6.1-1 UNITED STATES LABORATORY VACUUM EXHAUST SYSTEM/WASTE GAS SYSTEM INTERFACE LOCATIONS

TABLE 3.6.1.1-1 COMBUSTION INTEGRATED RACK VENT GASES (3 PAGES)

| Constituent | Mass (kg) | Temperature (°C) | Total Pressure (kPa) | Concentration* |
|------------------------------------|------------|------------------|----------------------|----------------|
| 1,1,1-Trichloroethane ¹ | 0.00000552 | 37.8 | 101.3 - 275.8 | 69 |
| 1,1-Dichloroethane ¹ | 4.56E-09 | 37.8 | 101.3 - 275.8 | 0.057 |
| 1,3-Butadiene | 0.00000088 | 37.8 | 101.3 - 275.8 | 11 |
| 1-Butene | 0.0000024 | 37.8 | 101.3 - 275.8 | 30 |
| 2-Butanone | 0.00000392 | 37.8 | 101.3 - 275.8 | 49 |
| 2-Methylpropane | 0.00000032 | 37.8 | 101.3 - 275.8 | 4 |
| 2-Methylpropene | 0.0000004 | 37.8 | 101.3 - 275.8 | 5 |
| 2-Propanone | 0.0002 | 37.8 | 101.3 - 275.8 | 2500 |
| Acetaldehyde | 0.00000088 | 37.8 | 101.3 - 275.8 | 11 |
| Acetic acid | 2.08E-08 | 37.8 | 101.3 - 275.8 | 0.26 |
| Acetonitrile | 3.36E-08 | 37.8 | 101.3 - 275.8 | 0.42 |
| Acetylene | 0.003 | 37.8 | 101.3 - 275.8 | 37500 |
| Acrolein | 0.00000072 | 37.8 | 101.3 - 275.8 | 9 |

TABLE 3.6.1.1-1 COMBUSTION INTEGRATED RACK VENT GASES (3 PAGES)

| Constituent | Mass (kg) | Temperature (°C) | Total Pressure (kPa) | Concentration* |
|----------------------------------|------------|------------------|----------------------|-----------------------|
| Benzene ¹ | 0.0000028 | 37.8 | 101.3 - 275.8 | 35 |
| n-butane | 0.003 | 37.8 | 101.3 - 275.8 | 37500 |
| Butene | 0.0000004 | 37.8 | 101.3 - 275.8 | 5 |
| Carbon dioxide | 6.8E-08 | 37.8 | 101.3 - 275.8 | 85% |
| Carbon monoxide | 2.4E-09 | 37.8 | 101.3 - 275.8 | 3% |
| Chlorobenzene ¹ | 5.6E-09 | 37.8 | 101.3 - 275.8 | 0.07 |
| Chloroethane | 0.00000008 | 37.8 | 101.3 - 275.8 | 1 |
| Chloromethane | 0.00000056 | 37.8 | 101.3 - 275.8 | 7 |
| cis-2-Butene | 0.000024 | 37.8 | 101.3 - 275.8 | 300 |
| Dichloromethane ¹ | 0.00000016 | 37.8 | 101.3 - 275.8 | 2 |
| Ethane | 0.00000416 | 37.8 | 101.3 - 275.8 | 52 |
| Ethene | 0.002 | 37.8 | 101.3 - 275.8 | 27844 |
| Ethanol ² | 0.0000072 | 37.8 | 101.3 - 275.8 | 90 |
| Formaldehyde | 0.00000072 | 37.8 | 101.3 - 275.8 | 9 |
| Heptane ¹ | 0.00324 | 37.8 | 101.3 - 275.8 | 40500 |
| n-Hexanal ¹ | 0.00000016 | 37.8 | 101.3 - 275.8 | 2 |
| Hydrogen | 0.0007 | 37.8 | 101.3 - 275.8 | 1.80% |
| Hydrogen cyanide | 0.00000256 | 37.8 | 101.3 - 275.8 | 32 |
| Hydrogen sulfide | 3.04E-08 | 37.8 | 101.3 - 275.8 | 0.38 |
| Isopropanol ² | 0.004 | 37.8 | 101.3 - 275.8 | 123 |
| m-Xylene ¹ | 6.96E-08 | 37.8 | 101.3 - 275.8 | 0.87 |
| Methane | 0.01 | 37.8 | 101.3 - 275.8 | 4.00% |
| Methanol ² | 0.00335 | 37.8 | 101.3 - 275.8 | 41875 |
| Methyl acetate | 0.000004 | 37.8 | 101.3 - 275.8 | 50 |
| Methyl methacrylate ¹ | 0.00003592 | 37.8 | 101.3 - 275.8 | 449 |
| n-Propyl acetate ¹ | 0.000008 | 37.8 | 101.3 - 275.8 | 100 |
| Nitrogen | 0.073 | 37.8 | 101.3 - 275.8 | 100% |
| o-Xylene ¹ | 0.000006 | 37.8 | 101.3 - 275.8 | 0.32 |
| Oxygen | 0.029 | 37.8 | 101.3 - 275.8 | 28% |
| Pentanal ¹ | 0.00000032 | 37.8 | 101.3 - 275.8 | 4 |
| Pentane | 0.00000016 | 37.8 | 101.3 - 275.8 | 2 |
| Propadiene | 0.00000016 | 37.8 | 101.3 - 275.8 | 2 |
| Propane | 0.0035 | 37.8 | 101.3 - 275.8 | 43750 |
| Propanol ² | 0.0035 | 37.8 | 101.3 - 275.8 | 43750 |
| Propene | 0.0015 | 37.8 | 101.3 - 275.8 | 18750 |
| Propyne | 0.00004 | 37.8 | 101.3 - 275.8 | 7 |
| Styrene ¹ | 0.00000016 | 37.8 | 101.3 - 275.8 | 2 |
| Sulfur dioxide | 0.00004 | 37.8 | 101.3 - 275.8 | 523 |
| tert-Butyl Alcohol ² | 0.0000064 | 37.8 | 101.3 - 275.8 | 80 |
| Toluene ¹ | 0.00000192 | 37.8 | 101.3 - 275.8 | 24 |
| Vinyl chloride | 3.2E-08 | 37.8 | 101.3 - 275.8 | 0.4 |
| Water vapor | n/a | 37.8 | 101.3 - 275.8 | Below 60° F Dew Point |
| 2-methyl propenal ² | 0.00000008 | 37.8 | 101.3 - 275.8 | 1 |
| Methyl acrylate ¹ | 0.00000176 | 37.8 | 101.3 - 275.8 | 22 |
| Cyclopentanone ¹ | 0.00000008 | 37.8 | 101.3 - 275.8 | 1 |
| Cyanogen chloride | 1.44E-08 | 37.8 | 101.3 - 275.8 | 0.18 |
| Cyanogen bromide ¹ | 4.96E-08 | 37.8 | 101.3 - 275.8 | 0.62 |

TABLE 3.6.1.1-1 COMBUSTION INTEGRATED RACK VENT GASES (3 PAGES)

| Constituent | Mass (kg) | Temperature (°C) | Total Pressure (kPa) | Concentration* |
|---|------------|------------------|----------------------|----------------|
| Acrylonitrile | 1.84E-08 | 37.8 | 101.3 - 275.8 | 0.23 |
| Benzonitrile ¹ | 2.08E-08 | 37.8 | 101.3 - 275.8 | 0.26 |
| Argon | 0.131 | 37.8 | 101.3 - 275.8 | 100% |
| Helium | 0.006 | 37.8 | 101.3 - 275.8 | 100% |
| Sulfur Hexafluoride ¹ | 0.478 | 37.8 | 101.3 - 275.8 | 100% |
| 1,1-Dichloroethene ¹ | 0.00000008 | 37.8 | 101.3 - 275.8 | 1 |
| Ethyl Isopropyl Ether ¹ | 0.0000016 | 37.8 | 101.3 - 275.8 | 20 |
| Ethyl Methyl Ether | 0.0000024 | 37.8 | 101.3 - 275.8 | 30 |
| 2-Ethyl-4-Methyl-1,3-Dioxolane ¹ | 0.0000024 | 37.8 | 101.3 - 275.8 | 30 |
| Ethyl n-Propyl Ether ¹ | 0.0000024 | 37.8 | 101.3 - 275.8 | 30 |
| Isopropyl Formate ¹ | 0.000008 | 37.8 | 101.3 - 275.8 | 100 |
| 2-Methyl-2-Butenal ¹ | 0.0000016 | 37.8 | 101.3 - 275.8 | 20 |
| 1-(1-Methylethoxy)-2-Propanone ¹ | 0.0000048 | 37.8 | 101.3 - 275.8 | 60 |
| Methyl Formate | 0.000008 | 37.8 | 101.3 - 275.8 | 100 |
| Propyl Formate ¹ | 0.0000024 | 37.8 | 101.3 - 275.8 | 30 |
| n-Propyl Isopropyl Ether ¹ | 0.000008 | 37.8 | 101.3 - 275.8 | 100 |
| Norflurane ¹ | 0.000016 | 37.8 | 101.3 - 275.8 | 200 |
| 2,2,4-Trimethyl-1,3-Dioxolane ¹ | 0.000016 | 37.8 | 101.3 - 275.8 | 200 |
| Vinyl Acetate ¹ | 0.0000004 | 37.8 | 101.3 - 275.8 | 5 |
| n-decane ¹ | 0.004 | 37.8 | 101.3 - 275.8 | 50000 |
| 1,3-Cyclopentadiene | 6.4E-08 | 37.8 | 101.3 - 275.8 | 0.8 |
| Trichlorofluoroethane ¹ | 2.48E-08 | 37.8 | 101.3 - 275.8 | 0.31 |
| Hexane ¹ | 0.00324 | 37.8 | 101.3-275.8 | 32400 |
| Octane ¹ | 0.00324 | 37.8 | 101.3-275.8 | 32400 |
| 1, 2, 4 Trimethylbenzene ¹ | 0.00000002 | 37.8 | 101.3-275.8 | 0.25 |
| Ethyl Benzene ¹ | 0.00000003 | 37.8 | 101.3-275.8 | 0.38 |

* Concentrations are in mg/m³ unless otherwise indicated.

Notes:

1. SSP 57000 Note D1-3 applies. (Each proposed gas with molecular weight greater than 75 Atomic Mass Unit (AMU) shall be analyzed in accordance with 4.3.6.1.5.C of SSP 57000.)
2. Ref PIRN 57000-NA-0264A and CR 5144. (Need Volatile Organic Compounds Usage Agreement.)
3. The rack integrator will define each gas to be vented through the VES/WGS and its associated characteristics in Table 3.6.1.1-1 for each venting event. Contingency events must also be addressed. When the pressures and/or durations exceed those specified in Section 3.6.3 of SSP 57025 for the VES/WGS in the USL, the rack integrator must clearly specify those durations.

3.6.1.2 INCOMPATIBLE GASES

A list of exhaust gases in each module that are incompatible with wetted materials of VES/WGS are documented in Appendix D of SSP 57000.

The CIR will provide containment, storage, and transport hardware for the gases that are incompatible with the VES/WGS as determined by not meeting the requirements in Paragraph 3.6.1.5 and 3.6.1.5.1 of SSP 57000 or the external environment requirement in Paragraph 3.6.1.5.2 of SSP 57000. The gases utilized by the integrated rack known to be incompatible with the VES/WGS are identified in Table 3.6.1.2-1, Combustion Integrated Rack Incompatible Gases (No Vent). These gases will not be vented to the ISS VES/WGS.

The CIR will be located only in the USL. All CIR gases to be vented overboard will be vented via the USL VES. Since the USL VES is two-fault tolerant against contamination of the ISS atmosphere during the venting process, there is no constraint on the toxicity of gases, which may be vented to that system.

**TABLE 3.6.1.2-1 COMBUSTION INTEGRATED RACK INCOMPATIBLE GASES
(NO VENT)**

| Gas | Mass (Kg) | Temperature _C | Reason For Incompatibility | Containment Method |
|------|-----------|-------------------|-------------------------------|-----------------------|
| None | | | | |
| | | | | |

Gases in Table 3.6.1.2-2, Combustion Integrated Rack Incompatible Gases (Vent Only After Remediation), will be diluted, filtered, or absorbed such that they meet the levels identified in Table 3.6.1.1-1 prior to venting.

**TABLE 3.6.1.2-2 COMBUSTION INTEGRATED RACK INCOMPATIBLE GASES
(VENT ONLY AFTER REMEDIATION)**

| Constituent | Mass (kg) | Temp (°C) | Remediation Method |
|----------------|-----------|-----------|--|
| Acetylene | 0.008 | 37.8 | Dilution with Nitrogen |
| n-butane | 0.008 | 37.8 | Activated Carbon Adsorption |
| n-decane | 0.110 | 37.8 | Activated Carbon Adsorption |
| Ethene | 0.008 | 37.8 | Dilution with Nitrogen |
| Heptane | 0.004 | 37.8 | Lithium Hydroxide Reaction |
| Hydrogen | 0.002 | 37.8 | Activated Carbon or Molecular Sieve Adsorption |
| Isopropanol | 0.008 | 37.8 | Activated Carbon or Molecular Sieve Adsorption |
| Methane | 0.019 | 37.8 | Dilution with Nitrogen |
| Methanol | 0.005 | 37.8 | Activated Carbon or Molecular Sieve Adsorption |
| Oxygen | 0.178 | 37.8 | Dilution with Nitrogen |
| Propane | 0.008 | 37.8 | Activated Carbon Adsorption |
| Propanol | 0.121 | 37.8 | Activated Carbon or Molecular Sieve Adsorption |
| Propene | 0.008 | 37.8 | Activated Carbon Adsorption |
| Sulfur dioxide | 0.009 | 37.8 | Lithium Hydroxide Reaction |
| Water vapor | N/A | 37.8 | Molecular Sieve or Silica Gel Adsorption |

3.6.2 VACUUM RESOURCE SYSTEM/VACUUM VENT SYSTEM

The VRS/VVS in the USL has the capability to maintain a single payload facility volume at 0.13 Pa (1.0×10^{-3} TORR) or less when the total gas load, including leakage and out/offgassing does not exceed 1.0×10^{-3} mbar-liter/sec assuming infinite conductance between payload facility

volume and the ISPR interface. The location of the VRS/VVS interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The VRS/VVS connector is defined in Table 3.1.2-1. The ISPR locations which provide VRS/VVS capabilities are identified in Figure 3.6.2-1, United States Laboratory Vacuum Resource System/Vacuum Vent System Interface Locations.

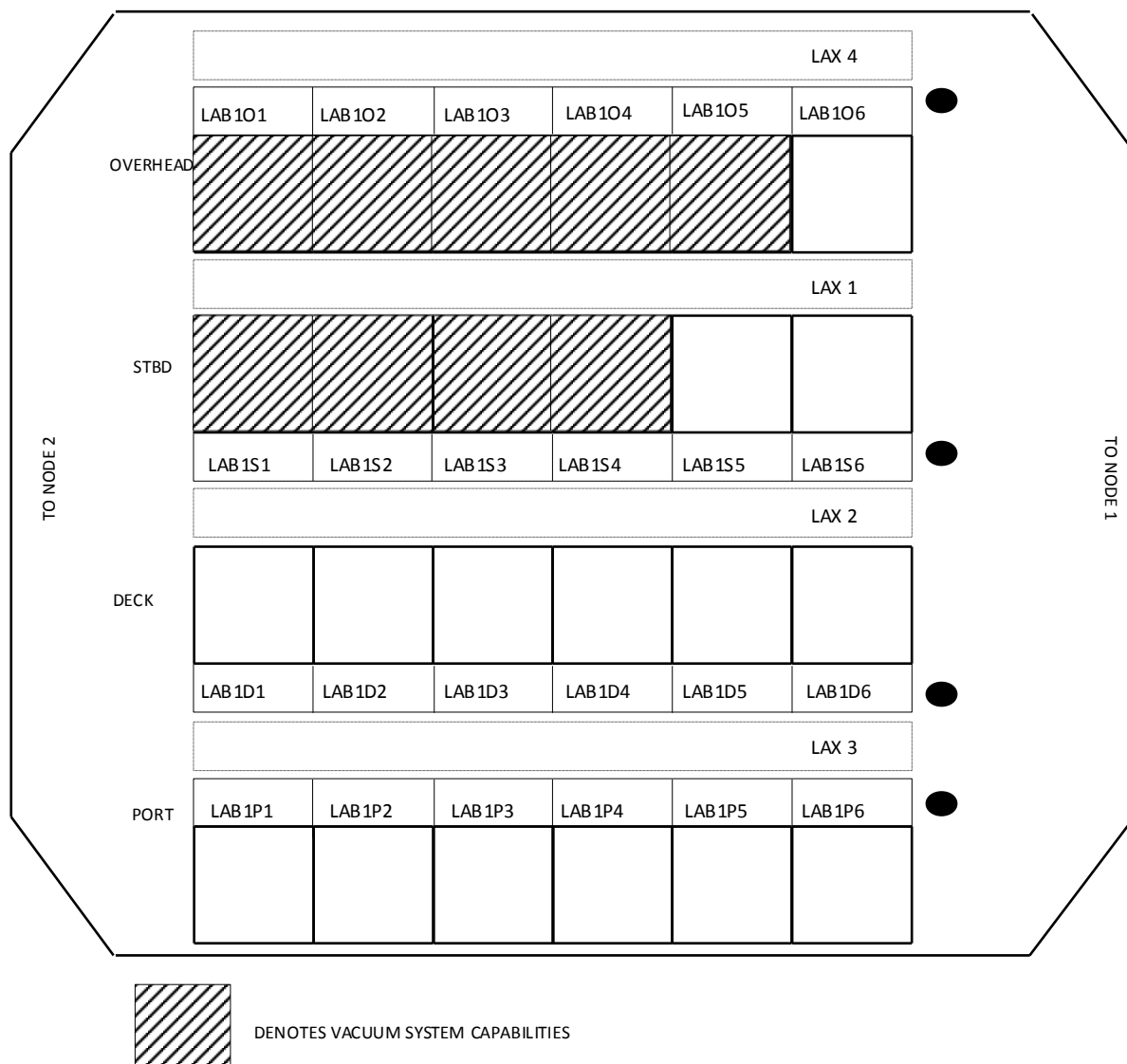


FIGURE 3.6.2-1 UNITED STATES LABORATORY VACUUM RESOURCE SYSTEM/VACUUM VENT SYSTEM INTERFACE LOCATIONS

3.6.2.1 ACCEPTABLE GASES

The only gases introduced by the CIR into the VRS will be the result of outgassing and leakage. This will include constituents identified in Table 3.6.1.1-1. VRS/VVS gases at 1×10^{-3} TORR or less are compatible with the VRS/VVS. The CIR will maintain pressure at the interface with the

VRS at or below 1×10^{-3} torr. A list of the VRS/VVS gases is provided in Table 3.6.2.1-1, Combustion Integrated Rack Vacuum Resource System/Vacuum Vent System Gases.

TABLE 3.6.2.1-1 COMBUSTION INTEGRATED RACK VACUUM RESOURCE SYSTEM/VACUUM VENT SYSTEM GASES

| Constituents |
|--------------|
| None |
| |

3.6.3 COLD CATHODE TRANSDUCER POWER OFF

The ISS VES Cold Cathode Transducer (CCT) will be powered off prior to any venting of the CIR. Payload operating procedures shall require Payloads Operations to coordinate with Mission Operations Directorate (MOD) Environmental Control and Life Support (ECLS) to power off the VES CCT prior to any venting of the CIR to the VES.

Powering off the VES CCT is necessary in order to protect the CCT from contamination failure due to exposure to combustion experiment byproducts and residuals or from outgassing of certain non-metallic materials.

The above guideline also applies to the VRS CCT if, at a future time, the CIR is connected to the VRS.

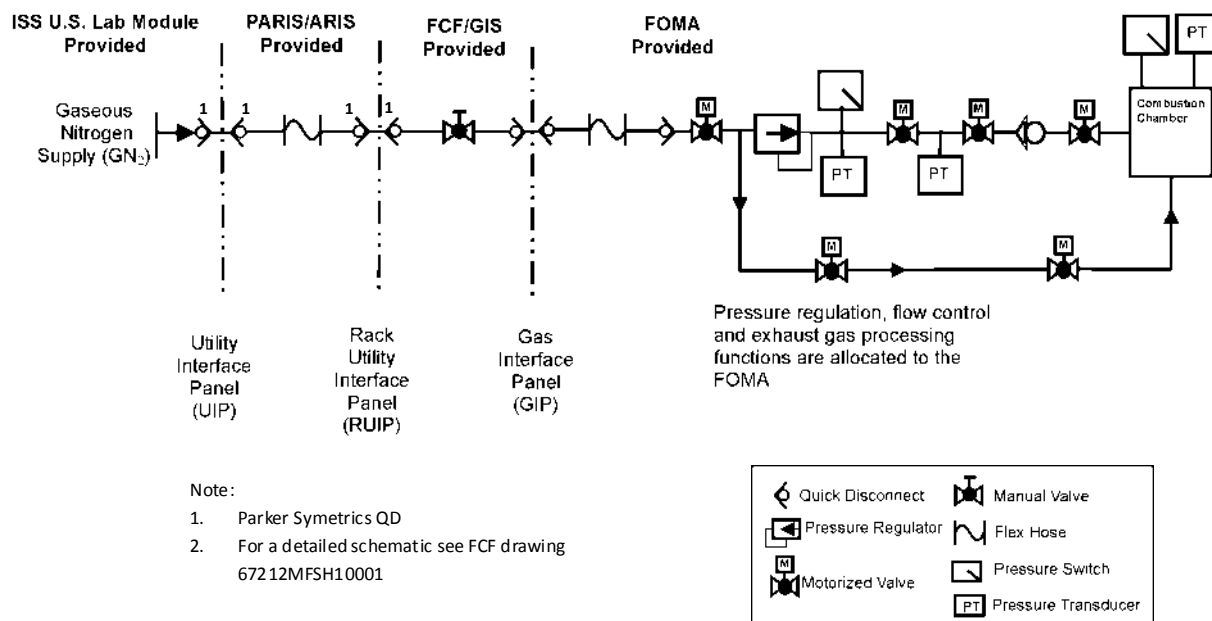
3.7 PRESSURIZED GASES INTERFACE REQUIREMENTS

The ISS provides gaseous nitrogen (GN_2) to the CIR.

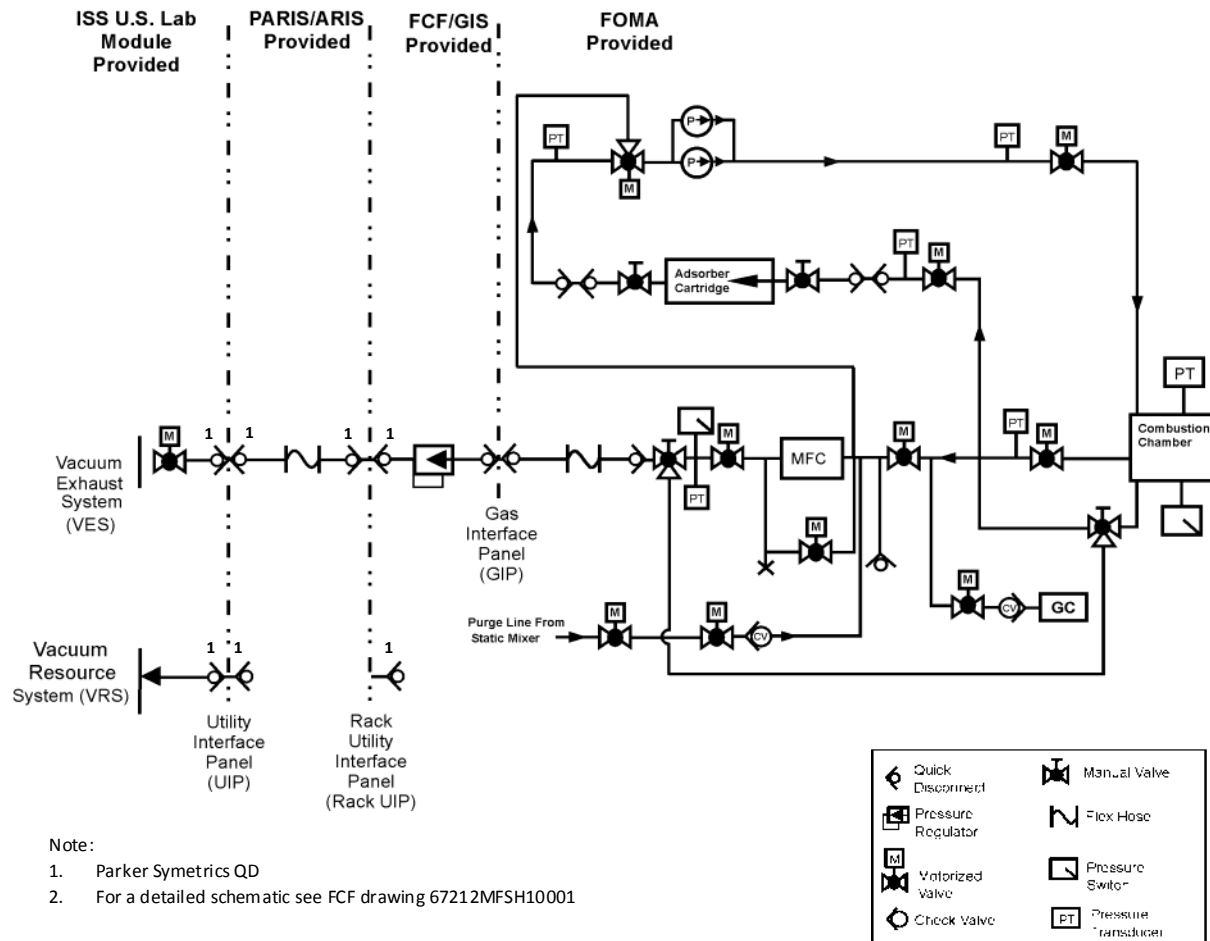
The location of the pressurized gas interfaces at the UIP are defined in Figures 3.1.2-1 and 3.1.2-2. The pressurized gas connectors are defined in Table 3.1.2-1.

The physical and chemical properties of the provided gases are per SSP 30573, Space Station Program Fluid Procurement and Use Control Specification.

A simplified schematic of the CIR pressurized system is provided in Figure 3.7-1, Combustion Integrated Rack Pressurized Gas Schematic.



**FIGURE 3.7-1 COMBUSTION INTEGRATED RACK
PRESSURIZED GAS SCHEMATIC (PAGE 1 OF 2)**



**FIGURE 3.7-1 COMBUSTION INTEGRATED RACK
PRESSURIZED GAS SCHEMATIC (PAGE 2 OF 2)**

3.8 PAYLOAD SUPPORT SERVICES INTERFACES REQUIREMENTS

3.8.1 POTABLE WATER INTERFACE

The CIR does not utilize the potable water interface.

3.8.2 FLUID SYSTEM SERVICER

The Fluid System Servicer (FSS) can supply ITCS coolant water to, or remove it from, the CIR on orbit. The FSS interface connectors are defined in Table 3.1.2-1. The physical and chemical properties of the ITCS coolant water are per SSP 30573.

The CIR will utilize the FSS for each process identified in Table 3.8.2-1. The quantity of coolant required by the CIR from the FSS and the quantity of coolant returned to the FSS is defined in Table 3.8.2-1, Fluid System Servicer Usage.

TABLE 3.8.2-1 FLUID SYSTEM SERVICER USAGE

| Process | Quantity Required (gal) | Quantity Returned (gal) |
|-----------------|--------------------------------|--------------------------------|
| Fluid Changeout | 1.8 | 1.8 |
| | | |
| | | |

3.9 ENVIRONMENTAL INTERFACES

3.9.1 DELETED

3.9.1.1 DELETED

3.9.1.2 DELETED

3.9.1.3 DELETED

3.9.2 ACOUSTICS

3.9.2.1 CONTINUOUS NOISE

An integrated rack which operates for more than 8 hours in a 24-hour period and generates a Sound Pressure Level (SPL) greater than or equal to 37 dBA is classified as a Continuous Noise Source. An integrated rack which is classified as a Continuous Noise Source must either meet the limits defined in Table 3.9.2.1-1, Continuous Noise, or demonstrate that the cumulative time it generates noise above the limits defined in Table 3.9.2.1-1 during a 24-hour period meets the Intermittent Noise Limits defined in Paragraph 3.9.2.2.

The CIR Continuous Noise characteristics are defined in Table 3.9.2.1-1.

TABLE 3.9.2.1-1 CONTINUOUS NOISE

| Overall A-Weighted SPL (dBA) | | |
|-------------------------------------|---------------------------------------|--------------------------------|
| Frequency Band (Hz) | Integrated Rack SPL (dB) Limit | CIR Continuous SPL (dB) |
| 63 | 64 | 49.6 |
| 125 | 56 | 51.2 |
| 250 | 50 | 48.6 |
| 500 | 45 | 46.1* |
| 1000 | 41 | 39.4 |
| 2000 | 39 | 33.9 |
| 4000 | 38 | 24.4 |
| 8000 | 37 | 19.3 |

* This value represents an exception condition described in 57217-NA-0040A.

3.9.2.2 INTERMITTENT NOISE

An integrated rack which operates for less than 8 hours in a 24 hour period and generates a SPL greater than or equal to 37 dBA measured at a distance of 0.6 meters from the noisiest part of the rack is classified as an Intermittent Noise Source. CIR Intermittent Values have a negligible impact to the approved continuous noise levels. CIR has been approved for continuous operations.

3.9.3 HUMIDITY INTERFACE

Equipment within the CIR does not condense humidity from the cabin atmosphere.

3.9.4 ACTIVE AIR EXCHANGE

Cabin air may be used for ventilation but may not be used for cooling of payload equipment mounted in the CIR.

The CIR does not utilize processes that involve active air exchange with cabin atmosphere.

4.0 APPLICABILITY MATRIX

4.1 PURPOSE

The purpose of this payload unique ICD is to define and control the design of interfaces and verification requirements between the ISS and the FCF/CIR. The integrated rack or payload interfaces and verification requirements are defined by direct reference to the corresponding sections and subsections of the Pressurized Payload Interface Requirements Document (IRD), SSP 57000. The Payload Developer and the ISS Payloads Office must mutually disposition each IRD paragraph and record that disposition in the applicability/verification matrix. The documented applicability/verification matrix for the CIR also serves as the verification requirements matrix for CIR.

4.2 ORGANIZATION

In the Applicability/Verification Matrix, Table 4.2-1, the numbers and headings are referenced to the corresponding section and subsection of the IRD. Shaded entries are included for reference only, and are not required to be dispositioned. Figure 4.2-1 defines the information that is addressed by each column in Table 4.2-1.

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method | Required Submittal Data | Submittal Date (L-X Mos.) | Subrack P/L Changeout Verification Method | Comments |
|---------------|-----------------|-----------------------|---------------------|-------------------------|---------------------------|---|----------|
| Block A | Block B | Block C | Block D | Block E | Block F | Block G | Block H |

- Block A - Contains the SSP 57000 Section 3 and Section 4 requirement numbers.
- Block B - Contains the SSP 57000 Section 3 requirement title.
- Block C - Each paragraph of the IRD shall be dispositioned in the “Payload Applicability” column with one of the following:
 - A Applicable to this ICD, indicating that the referenced interface is utilized by the integrated rack facility or payload hardware item.
 - N/A Not Applicable to this ICD, indicating that the referenced interface is utilized by the integrated rack facility or payload hardware item. Rationale is required for each requirement listed as N/A (See Block H)
 - E-## Exception for this requirement has been submitted and is listed in the “Exceptions” table.
- Block D - Contains the SSP 57000 Section 4 verification method. Also contains title, NVR, and Safety for requirements approved through the PSRP.
- Block E - Contains the data submittal that is required by OZ3.
- Block F - Contains the date the submittal data is required by OZ3. (In Launch minus month format).
- Block G - Identifies the verification method used to address the requirement when a subrack payload is changed out within a rack that remains on orbit.
- Block H - Used for any relevant comments that need to be added, including information regarding deviation from template methodology and rationale explaining any requirement listed as N/A.

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|------------------------------|---|----------------------------|------------------------|----------------------------|---------------------------|--|---|
| 3.0 / 4.3.0 | PAYLOAD INTERFACE REQUIREMENTS AND GUIDANCE | | TITLE | N/A | N/A | N/A | |
| 3.1 / 4.3.1 | STRUCTURAL/MECHANICAL, MICROGRAVITY, AND STOWAGE INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.1.1 / 4.3.1.1 | STRUCTURAL/MECHANICAL | | TITLE | N/A | N/A | N/A | |
| 3.1.1.1. A / 4.3.1.1.1. A | GSE Interfaces | E | I | Certificate of Compliance. | L-3.5 | N/A | 57217-NA-0035A |
| 3.1.1.1. B / 4.3.1.1.1. B | GSE Interfaces | A | D | Certificate of Compliance. | L-3.5 | N/A | |
| 3.1.1.1. C / 4.3.1.1.1. C | GSE Interfaces | A | D | Certificate of Compliance. | L-3.5 | N/A | |
| 3.1.1.1. D / 4.3.1.1.1. D | GSE Interfaces | A | T&A | Certificate of Compliance. | L-3.5 | N/A | |
| 3.1.1.2. A / 4.3.1.1.2. A | MPLM Interfaces | A | I | Certificate of Compliance. | L-3.5 | N/A [†] | |
| 3.1.1.2. B / 4.3.1.1.2. B | MPLM Interfaces | A | A or I* | Certificate of Compliance. | L-3.5 | A | *Inspection method is only acceptable for NASA provided 683-50243-4 ISPRs with intact and unblocked pressure relief valves. |
| 3.1.1.2. C / 4.3.1.1.2. C | DELETED | | N/A | N/A | N/A | N/A | |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|-------------------------------------|-----------------------|------------------------|--|---------------------------|--|----------|
| 3.1.1.2. D / 4.3.1.1.2. D | DELETED | | N/A | N/A | N/A | N/A | |
| 3.1.1.2. E / 4.3.1.1.2. E | MPLM Interfaces | A | A ¹ | 1. Data Cert, based on static analysis using approved FEM (or DCL analysis results), providing the MPLM interface attach point forces and margins of safety calculations based on the allowable limits as specified in SSP 41017 Part 1, par. 3.2.1.4.3. 2. Data Cert providing the MPLM interface attach point forces and margins of safety calculations based on the allowable limits as specified in SSP 41017 Part 1, par. 3.2.1.4.3. | 1. L-7.5 2. L-5 | A | |
| 3.1.1.2.1 / 4.3.1.1.2.1 | MPLM Late/Early Access Requirements | A | T | Certificate of Compliance | L-3.5 | T | |
| 3.1.1.2.1.1. A / 4.3.1.1.2.1.1. A | MPLM Late Access Envelope (KSC) | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.1.1.2.1.1. B / 4.3.1.1.2.1.1. B | MPLM Late Access Envelope (KSC) | A | I | Certificate of Compliance | L-3.5 | I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|-----------------------|------------------------|---|---------------------------|--|----------|
| 3. 1. 1. 2. 1. 1. C / 4. 3. 1. 1. 2. 1. 1. C | MPLM Late Access Envelope (KSC) | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 1. 1. 2. 1. 2. A / 4. 3. 1. 1. 2. 1. 2. A | MPLM Early Access Envelopes (KSC and DFRC) | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 1. 1. 2. 1. 2. B / 4. 3. 1. 1. 2. 1. 2. B | MPLM Early Access Envelopes (KSC and DFRC) | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 1. 1. 3. A / 4. 3. 1. 1. 3. A | Loads Requirements | A | A ¹ | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1. L-7.5 2. L-5 | A | |
| 3. 1. 1. 3. B / 4. 3. 1. 1. 3. B | Loads Requirements | A | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1. L-7.5 2. L-5 | A | |
| 3. 1. 1. 3. C / 4. 3. 1. 1. 3. C | Loads Requirements | A | I | Certificate of Compliance | L-3.5 | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|--------------------|----------------------------|------------------------|---|---------------------------|--|----------------------------------|
| 3. 1. 1. 3. D / 4. 3. 1. 1. 3. D | Loads Requirements | E | A | Data Cert providing a summary listing as defined in SSP 57000, Table 3.1.1.3-1 showing positive margins of safety | L-7.5 | A | 57217-NA-0010A 57217-NA-0036B |
| 3. 1. 1. 3. E / 4. 3. 1. 1. 3. E | Loads Requirements | A | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1. L-7.5 2. L-5 | A | |
| 3. 1. 1. 3. F / 4. 3. 1. 1. 3. F | Loads Requirements | A | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1. L-7.5 2. L-5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|-------------------|----------------------------|------------------------|--|---------------------------|--|---|
| 3. 1. 1. 4. A / 4. 3. 1. 1. 4. A | Rack Requirements | E | D&A ¹ | Data Cert providing weight and CG summaries for launch and landing of the integrated rack. | L-7 | T&A | 57227-NA-0008 57217-NA-0005C 57217-NA-0002C 57217-NA-0016A |
| 3. 1. 1. 4. B / 4. 3. 1. 1. 4. B | Rack Requirements | A | A or I* | Certificate of Compliance | L-3.5 | A | *Inspection method is only acceptable for NASA provided 683-50243-4 ISPRs with intact and unblocked pressure relief valves. |
| 3. 1. 1. 4. C / 4. 3. 1. 1. 4. C | Rack Requirements | E | A ¹ | Certificate of Compliance | L-5 | A | 57217-NA-0008C |
| 3. 1. 1. 4. D / 4. 3. 1. 1. 4. D | Rack Requirements | | NVR | N/A | N/A | N/A | |
| 3. 1. 1. 4. E / 4. 3. 1. 1. 4. E | Rack Requirements | E | I | Certificate of Compliance | L-3.5 | I | 57217-NA-0039 |
| 3. 1. 1. 4. F / 4. 3. 1. 1. 4. F | Rack Requirements | N/A | A | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the lab window location. |
| 3. 1. 1. 4. G / 4. 3. 1. 1. 4. G | DELETED | | N/A | N/A | N/A | N/A | |
| 3. 1. 1. 4. H / 4. 3. 1. 1. 4. H | DELETED | | N/A | N/A | N/A | N/A | |
| 3. 1. 1. 4. I / 4. 3. 1. 1. 4. I | Rack Requirements | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 1. 1. 4. J / 4. 3. 1. 1. 4. J | DELETED | | N/A | N/A | N/A | N/A | |
| 3. 1. 1. 4. K / 4. 3. 1. 1. 4. K | Rack Requirements | A | A | Certificate of Compliance | L-3.5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---------------------------------------|-----------------------|------------------------|---------------------------|---------------------------|--|--|
| 3. 1. 1. 4. L / 4. 3. 1. 1. 4. L | Rack Requirements | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 1. 1. 4. M / 4. 3. 1. 1. 4. M | Rack Requirements | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 1. 1. 4. N / 4. 3. 1. 1. 4. N | Rack Requirements | A | A | Certificate of Compliance | L-3.5 | N/A | |
| 3. 1. 1. 4. O / 4. 3. 1. 1. 4. O | Rack Requirements | A | A | Certificate of Compliance | L-3.5 | N/A | PaRIS accommodates snubber Keep Out envelope as defined in SSP 57058, 3.2.1.1.2. |
| 3. 1. 1. 4. P / 4. 3. 1. 1. 4. P | Rack Requirements | N/A | A | Certificate of Compliance | L-3.5 | A | Requirement not applicable for racks utilizing PaRIS. |
| 3. 1. 1. 4. Q / 4. 3. 1. 1. 4. Q | Rack Requirements | N/A | A | Certificate of Compliance | L-3.5 | N/A | CIR does not have a pressure device on the front of the rack. |
| 3. 1. 1. 4. R / 4. 3. 1. 1. 4. R | Rack Requirements | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3. 1. 1. 4. S / 4. 3. 1. 1. 4. S | Rack Requirements | N/A | I or A&I | Certificate of Compliance | L-3.5 | N/A | CIR will not be operated in the JEM. |
| 3. 1. 1. 4. 1. A / 4. 3. 1. 1. 4. 1. A | Lab Window Rack Location Requirements | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not utilize the lab window location |
| 3. 1. 1. 4. 1. B / 4. 3. 1. 1. 4. 1. B | Lab Window Rack Location Requirements | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not utilize the lab window location |
| 3. 1. 1. 4. 1. C / 4. 3. 1. 1. 4. 1. C | Lab Window Rack Location Requirements | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not utilize the lab |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|-----------------------|----------------------------|---|---------------------------|--|---|
| | | | | | | | window location. |
| 3. 1. 1. 4. 1. D / 4. 3. 1. 1. 4. 1. D | Lab Window Rack Location Requirements | N/A | I | Certificate of Compliance | L-3.5 | A | CIR does not utilize the lab window location. |
| 3. 1. 1. 5. / 4. 3. 1. 1. 5 | Safety Critical Structures Requirements | A | Per SSP 52005 ¹ | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1. L-7.5 2. L-5 | Per SSP 52005A | |
| 3. 1. 1. 6 / 4. 3. 1. 1. 6 | CONNECTOR AND UMBILICAL PHYSICAL MATE | | TITLE | N/A | N/A | N/A | |
| 3. 1. 1. 6. 1 / 4. 3. 1. 1. 6. 1 | Connector Physical Mate | A | D | Certificate of Compliance | L-3.5 | D | |
| 3. 1. 1. 6. 2 / 4. 3. 1. 1. 6. 2 | Umbilical Physical Mate | A | D | Certificate of Compliance | L-3.5 | N/A | |
| 3. 1. 1. 7. A / 4. 3. 1. 1. 7. A | On-Orbit Payload Protrusions | E | I | Data Cert providing drawings identifying all protrusions. | L-7.5 | I | 57217-NA-0029B |
| 3. 1. 1. 7. B / 4. 3. 1. 1. 7. B | On-Orbit Payload Protrusions | A | D or A | Certificate of Compliance | L-3.5 | D or A | |
| 3. 1. 1. 7. 1 / 4. 3. 1. 1. 7. 1 | On-Orbit Permanent Protrusions | E | I | Data Cert providing drawings identifying all protrusions. | L-7.5 | I | 57217-NA-0033 |
| 3. 1. 1. 7. 2. A / 4. 3. 1. 1. 7. 2. A | On-Orbit Semi-Permanent Protrusions | A | I | Data Cert providing drawings identifying all protrusions. | L-7.5 | I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|----------------------------|------------------------|---|---------------------------|--|----------------------------------|
| 3. 1. 1. 7. 2. B / 4. 3. 1. 1. 7. 2. B | On-Orbit Semi-Permanent Protrusions | A | I | Data Cert providing drawings identifying all protrusions. | L-7.5 | I | |
| 3. 1. 1. 7. 2. C / 4. 3. 1. 1. 7. 2. C | On-Orbit Semi-Permanent Protrusions | A | D | Certificate of Compliance | L-3.5 | D | |
| 3. 1. 1. 7. 3. A / 4. 3. 1. 1. 7. 3. A | On-Orbit Temporary Protrusions | E | I | Data Cert providing drawings identifying all protrusions. | L-7.5 | I | 57217-NA-0001A 57217-NA-0046B |
| 3. 1. 1. 7. 3. B / 4. 3. 1. 1. 7. 3. B | On-Orbit Temporary Protrusions | A | D | Certificate of Compliance | L-3.5 | D | |
| 3. 1. 1. 7. 4 / 4. 3. 1. 1. 7. 4 | On-Orbit Momentary Protrusions | A | D | Certificate of Compliance | L-3.5 | D | |
| 3. 1. 1. 7. 5 / 4. 3. 1. 1. 7. 5. | On-Orbit Protrusions For Keep Alive Payloads | N/A | I | Data Cert providing drawings identifying all protrusions. | L-7.5 | I | CIR is not a Keep Alive payload. |
| 3. 1. 2 / 4. 3. 1. 2 | MICROGRAVITY | | NVR | N/A | N/A | N/A | |
| 3. 1. 2. 1 / 4. 3. 1. 2. 1 | Quasi-Steady Requirements | A | A | Analysis Report | L-7.5 | A | |
| 3. 1. 2. 2 / 4. 3. 1. 2. 2 | Vibratory Requirements / Mechanical Vibration | A | A or T | Analysis or Test Report | L-7.5 | A or T&A | |
| 3. 1. 2. 3. A / 4. 3. 1. 2. 3. A | Transient Requirements | A | A or T | Analysis or Test Report | L-7.5 | A or T&A | |
| 3. 1. 2. 3. B / 4. 3. 1. 2. 3. B | Transient Requirements | A | A or T | Analysis or Test Report | L-7.5 | A or T&A | |
| 3. 1. 2. 4 / 4. 3. 1. 2. 4 | Microgravity Environment | | NVR | N/A | N/A | N/A | |
| 3. 1. 2. 5 / 4. 3. 1. 2. 5 | ARIS Rack Vibratory Requirement / ARIS On-Board to Off-Board Vibratory Requirement | N/A | A or T | Analysis or Test Report | L-7.5 | A or T&A | CIR does not use ARIS. |
| 3. 1. 2. 6 / 4. 3. 1. 2. 6 | Angular Momentum Limits | | NVR | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|----------------------------|--|----------------------------|------------------------|---------------------------|---------------------------|--|-----------------------------------|
| 3.1.2.6.1 / 4.3.1.2.6.1 | Limit Disturbance Induced ISS Attitude Rate | A | A | Analysis Report | L-7.5 | A | |
| 3.1.2.6.2 / 4.3.1.2.6.2 | Limit Disturbance Induced CMG Momentum Usage | A | A | Analysis Report | L-7.5 | A | |
| 3.1.3 / 4.3.1.3 | Stowage | | NVR | N/A | N/A | N/A | |
| 3.2 / 4.3.2 | ELECTRICAL INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.2.1 / 4.3.2.1 | Electrical Power Characteristics | | NVR | N/A | N/A | N/A | |
| 3.2.1.1 / 4.3.2.1.1 | STEADY-STATE VOLTAGE CHARACTERISTICS | | TITLE | N/A | N/A | N/A | |
| 3.2.1.1.1 / 4.3.2.1.1.1 | Interface B | A | T | Certificate of Compliance | L-3.5 | T&A | |
| 3.2.1.1.2 / 4.3.2.1.1.2 | Interface C | N/A | T | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize Interface C. |
| 3.2.1.2 / 4.3.2.1.2 | RIPPLE VOLTAGE CHARACTERISTICS | | TITLE | N/A | N/A | N/A | |
| 3.2.1.2.1 / 4.3.2.1.2.1 | Ripple Voltage and Noise | A | A | Certificate of Compliance | L-3.5 | T&A | |
| 3.2.1.2.2 / 4.3.2.1.2.2 | Ripple Voltage Spectrum | A | A | Certificate of Compliance | L-3.5 | T&A | |
| 3.2.1.3 / 4.3.2.1.3 | TRANSIENT VOLTAGES | | TITLE | N/A | N/A | N/A | |
| 3.2.1.3.1 / 4.3.2.1.3.1 | Interface B | A | T or A | Certificate of Compliance | L-3.5 | T&A | |
| 3.2.1.3.2 / 4.3.2.1.3.2 | Interface C | N/A | T or A | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize Interface |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|-----------------------|------------------------|---------------------------|---------------------------|--|---|
| | | | | | | | C. |
| 3. 2. 1. 3. 3 / 4. 3. 2. 1. 3. 3 | Fault Clearing and Protection | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 2. 1. 3. 4. A / 4. 3. 2. 1. 3. 4. A | Non-Normal Voltage Range | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 2. 1. 3. 4. B / 4. 3. 2. 1. 3. 4. B | Non-Normal Voltage Range | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 2. 2 / 4. 3. 2. 2 | ELECTRICAL POWER INTERFACE | | TITLE | N/A | N/A | N/A | |
| 3. 2. 2. 1. A / 4. 3. 2. 2. 1. A | UIP, UOP, and SUP Connectors and Pin Assignments | | NVR | N/A | N/A | N/A | |
| 3. 2. 2. 1. B / 4. 3. 2. 2. 1. B | UIP, UOP, and SUP Connectors and Pin Assignments | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the UOP. |
| 3. 2. 2. 1. C / 4. 3. 2. 2. 1. C | UIP, UOP, and SUP Connectors and Pin Assignments | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the UOP. |
| 3. 2. 2. 1. D / 4. 3. 2. 2. 1. D | UIP, UOP, and SUP Connectors and Pin Assignments | | NVR | N/A | N/A | N/A | |
| 3. 2. 2. 1. E / 4. 3. 2. 2. 1. E | UIP, UOP, and SUP Connectors and Pin Assignments | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the UOP. |
| 3. 2. 2. 1. F / 4. 3. 2. 2. 1. F | UIP, UOP, and SUP Connectors and Pin Assignments | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the UOP. |
| 3. 2. 2. 1. G / 4. 3. 2. 2. 1. G | UIP, UOP, and SUP Connectors and Pin Assignments | | NVR | N/A | N/A | N/A | |
| 3. 2. 2. 1. H / 4. 3. 2. 2. 1. H | UIP, UOP, and SUP Connectors and Pin Assignments | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the UOP and will not |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|--|----------------------------|------------------------|---|---------------------------|--|---|
| | | | | | | | operate in the APM. |
| 3. 2. 2. 1. I / 4. 3. 2. 2. 1. I | UIP, UOP, and SUP Connectors and Pin Assignments | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the UOP and will not operate in the APM. |
| 3. 2. 2. 2. A / 4. 3. 2. 2. 2. A | Power Bus Isolation | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 2. 2. 2. B / 4. 3. 2. 2. 2. B | Power Bus Isolation | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 2. 2. 3 / 4. 3. 2. 2. 3 | Compatibility With Soft Start/Stop RPC | A | T | Certificate of Compliance | L-3.5 | T&A | |
| 3. 2. 2. 4 / 4. 3. 2. 2. 4 | Surge Current | A | T&A | 1. Analysis report including surge current profiles for common integrated rack configurations. 2. Test report. | 1. L-7.5 2. L-7.5 | T&A | |
| 3. 2. 2. 5 / 4. 3. 2. 2. 5 | Reverse Energy/Current | | NVR | N/A | N/A | N/A | |
| 3. 2. 2. 5. 1 / 4. 3. 2. 2. 5. 1 | Reverse Current Limits | A | A | Analysis Report (Description of model, parameters and the results of Analysis) | L-7.5 | A | |
| 3. 2. 2. 5. 2 / 4. 3. 2. 2. 5. 2 | Transients Partially Contained Within The Envelope | A | A | Analysis Report (Description of model, parameters and the results of Analysis) | L-7.5 | A | |
| 3. 2. 2. 6 / 4. 3. 2. 2. 6 | CIRCUIT PROTECTION DEVICES | | TITLE | N/A | N/A | N/A | |
| 3. 2. 2. 6. 1 / | ISS EPS CIRCUIT | | TITLE | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|---------------------------------|----------------------------|------------------------|--|---------------------------|--|---------------------------------------|
| 4.3.2.2.6.1 | PROTECTION CHARACTERISTICS | | | | | | |
| 3.2.2.6.1.1. A / 4.3.2.2.6.1.1. A | Remote Power Controllers (RPCs) | A | A | Analysis of test data required by 4.3.2.2.4. | L-7.5 | A | |
| 3.2.2.6.1.1. B / 4.3.2.2.6.1.1. B | Remote Power Controllers (RPCs) | N/A | A | Analysis of test data required by 4.3.2.2.4. | L-7.5 | A | CIR is not powered while in the MPLM. |
| 3.2.2.6.1.1. C / 4.3.2.2.6.1.1. C | Remote Power Controllers (RPCs) | N/A | A | Analysis of test data required by 4.3.2.2.4. | L-7.5 | A | CIR does not utilize the UOP. |
| 3.2.2.6.1.1. D / 4.3.2.2.6.1.1. D | Remote Power Controllers (RPCs) | A | A | Analysis data. | L-7.5 | A | |
| 3.2.2.6.1.1. E / 4.3.2.2.6.1.1. E | Remote Power Controllers (RPCs) | A | A | Analysis data. | L-7.5 | A | |
| 3.2.2.6.1.1. F / 4.3.2.2.6.1.1. F | Remote Power Controllers (RPCs) | N/A | T | Test report showing compliance with the requirement. | L-7.5 | N/A | CIR does not utilize the SUP. |
| 3.2.2.6.2 / 4.3.2.2.6.2 | EPCE RPC INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.2.2.6.2.1 / 4.3.2.2.6.2.1 | RPC TRIP COODINATION | | TITLE | N/A | N/A | N/A | |
| 3.2.2.6.2.1.1 / 4.3.2.2.6.2.1.1 | Payload Trip Rating | E | A | Analysis Data | L-7.5 | A | 57217-NA-0045 |
| 3.2.2.7 / 4.3.2.2.7 | EPCE COMPLEX LOAD IMPEDANCES | | TITLE | N/A | N/A | N/A | |
| 3.2.2.7.1. A / 4.3.2.2.7.1. A | Interface B | A | T | Test report showing compliance with the Unique Payload Hardware ICD. | L-7.5 | T&A | |
| 3.2.2.7.1. B / 4.3.2.2.7.1. B | Interface B | A | T | Test report showing compliance with the Unique Payload Hardware ICD. | L-7.5 | T&A | |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|---------------------------------------|----------------------------|------------------------|--|---------------------------|--|-----------------------------------|
| 3. 2. 2. 7. 2 / 4. 3. 2. 2. 7. 2 | Interface C | N/A | T | Test report showing compliance with the Unique Payload Hardware ICD. | L-7.5 | N/A | CIR does not utilize Interface C. |
| 3. 2. 2. 8 / 4. 3. 2. 2. 8 | Large Signal Stability | E | T&A | Analysis and test data for each integrated rack and EPCE. | L-7.5 | T&A | 57217-NA-0009 |
| 3. 2. 2. 9 / 4. 3. 2. 2. 9 | DELETED | | N/A | N/A | N/A | N/A | |
| 3. 2. 2.10. A / 4. 3. 2. 2.10. A | Electrical Load-Stand Alone Stability | A | A | Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required. | L-7.5 | T&A | November 2010 |
| 3. 2. 2.10. B / 4. 3. 2. 2.10. B | Electrical Load-Stand Alone Stability | A | A | Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required. | L-7.5 | T&A | |
| 3. 2. 2.10. C / 4. 3. 2. 2.10. C | Electrical Load-Stand Alone Stability | A | A | Analysis report (A brief summary of the results of EMI/EMC tests). A | L-7.5 | T&A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|-----------------------|------------------------|---|---------------------------|--|--|
| | | | | detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required. | | | |
| 3. 2. 2.11 / 4. 3. 2. 2.11 | DELETED | | N/A | N/A | N/A | N/A | |
| 3. 2. 2.12 / 4. 3. 2. 2.12 | Maximum Load Step Size | A | T | Certificate of Compliance | L-3.5 | A | |
| 3. 2. 2. 13 / 4. 3. 2. 2. 13 | SUP GFI AC Characteristics | | NVR | N/A | N/A | N/A | |
| 3. 2. 2. 13 .1 / 4. 3. 2. 2. 13.1 | Common Mode Capacitance | N/A | A | Analysis showing compliance with the requirement | L-7.5 | N/A | CIR does not utilize Interface C. |
| 3. 2. 2. 13. 2 / 4. 3. 2. 2. 13. 2 | Leakage Currents | | NVR | N/A | N/A | N/A | |
| 3. 2. 2. 13. 2. 1 / 4. 3. 2. 2. 13. 2. 1 | Frequency Domain Leakage Limits | N/A | T | Test report showing compliance with the requirement | L-7.5 | N/A | CIR does not utilize Interface C. |
| 3. 2. 2. 13. 2. 2 / 4. 3. 2. 2. 13. 2. 2 | Time Domain Leakage Limits | N/A | T | Test report showing compliance with the requirement | L-7.5 | N/A | CIR does not utilize Interface C. |
| 3. 2. 2. 14 / 4. 3. 2. 2. 14 | Columbus Module "Power Off" Residual Voltage Level | N/A | T or I | Certificate of Compliance | L-3.5 | N/A | CIR is not manifested in the Columbus. |
| 3. 2. 2. 15 / 4. 3. 2. 2. 15 | JEM "Power Off" Residual Voltage Level | N/A | T or I | Certificate of Compliance | L-3.5 | N/A | CIR is not manifested in the JEM. |
| 3. 2. 3 / 4. 3. 2. 3 | ELECTRICAL POWER CONSUMER | | TITLE | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|------------------------------|----------------------------------|-------------------------------|---------------------------|---|------------------------------------|---|----------------------------------|
| | CONSTRAINTS | | | | | | |
| 3.2.3.1. A / 4.3.2.3.1. A | Wire Derating | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not utilize the UOP. |
| 3.2.3.1. B / 4.3.2.3.1. B | Wire Derating | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.2.3.1. C / 4.3.2.3.1. C | Wire Derating | E | I or A | Certificate of Compliance | L-3.5 | A | 57217-NA-0027 57217-NA-0017A |
| 3.2.3.2. A / 4.3.2.3.2. A | Exclusive Power Feeds | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.2.3.2. B / 4.3.2.3.2. B | Exclusive Power Feeds | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.2.3.3 / 4.3.2.3.3 | Loss of Power | A | Safety ² | Certificate of Compliance | L-3.5 | A | |
| 3.2.4 / 4.3.2.4 | Electromagnetic Compatibility | A | T&A or T&A&I | 1. Test Report 2. Analysis Report | 1. L-7.5 2. L-7.5 | N/A | |
| 3.2.4.1 / 4.3.2.4.1 | Electrical Grounding | E | T&A | 1. Analysis report showing compliance with SSP 30240 Sec. 3. 2. Certificate of Compliance for the test | 1. L-7.5 2. L-3.5 | T&A | 57217-NA-0032 |
| 3.2.4.2 / 4.3.2.4.2 | Electrical Bonding | E | T&A&I | 1. Test report showing compliance with SSP 30245, and NSTS 1700.7B/ISS, 213 and 220. 2. Analysis report showing compliance with SSP 30245, NSTS 1700.7B/ISS, 213 and 220, and the Unique Payload Hardware ICD. | 1. L-7.5 2. L-7.5 | T&A | 57217-NA-0012 |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------|--|----------------------------|------------------------|---|---------------------------|--|--|
| | | | | 3. Certificate of Compliance for the inspection. | 3. L-3.5 | | |
| 3. 2. 4. 3 / 4. 3. 2. 4. 3 | Cable/Wire Design and Control Requirements | E | T or A or I | 1. Analysis report showing compliance with SSP 30242. 2. Certificate of Compliance for the test or inspection. | 1. L-7.5 2. L-3.5 | A | 57217-NA-0044 |
| 3. 2. 4. 4 / 4. 3. 2. 4. 4 | Electromagnetic Interference | E | T&A | 1. Test Report 2. Analysis report for the integrated rack based on sub-rack and/or rack equipment test data. | 1. L-7.5 2. L-7.5 | T&A | 57217-NA-0017 57217-NA-0031A 57217-NA-0037A 57217-NA-0053 |
| 3. 2. 4. 5 / 4. 3. 2. 4. 5 | Electrostatic Discharge | E | T or A&I | 1. A report on test results or an analysis showing compliance during functional testing. 2. Certificate of Compliance (COC) showing that the inspection identifies labeling of integrated rack and EPCE. | 1. L-7.5 2. L-3.5 | T or A&I | 57217-NA-0031A |
| 3. 2. 4. 6 / 4. 3. 2. 4. 6 | Alternating Current (ac) Magnetic Fields | E | T | Test results that meet the limits of 3.2.4.6. | L-7.5 | T | 57217-NA-0030 |
| 3. 2. 4. 7 / 4. 3. 2. 4. 7 | Direct Current (dc) Magnetic Fields | A | T | Test results that meet the limits of 3.2.4.7. | L-7.5 | T | |
| 3. 2. 4. 8 / 4. 3. 2. 4. 8 | Corona | A | T or A | 1. Detailed analysis of corona design techniques, voltage levels, and any gases | 1. L-7.5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|---|----------------------------|------------------------|---|---------------------------|--|---------------|
| | | | | plus operating environment. 2. Test report identifying test configuration plus the test results. | 2. L-7.5 | | |
| 3. 2. 4. 9 / 4. 3. 2. 4. 9 | Lightning | A | A | Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1. | L-7.5 | A | |
| 3. 2. 4.10 / 4. 3. 2. 4.10 | EMI Susceptibility for Safety-Critical Circuits | A | T&A | Analysis report with supporting test data. | L-7.5 | A | |
| 3. 2. 4.11 / 4. 3. 2. 4.11 | Intentional Radiating and Receiving Certification | N/A | I | Certificate of Compliance | L-3.5 | A | No RF devices |
| 3. 2. 5 / 4. 3. 2. 5 | SAFETY REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 2. 5. 1 / 4. 3. 2. 5. 1 | PAYLOAD ELECTRICAL SAFETY | | TITLE | N/A | N/A | N/A | |
| 3. 2. 5. 1. 1 / 4. 3. 2. 5. 1. 1 | Mating/Demating of Powered Connectors | A | Safety ² | Certificate of Compliance | L-3.5 | N/A | |
| 3. 2. 5. 1. 2 / 4. 3. 2. 5. 1. 2 | Safety-Critical Circuits Redundancy | A | Safety ² | Certificate of Compliance | L-3.5 | N/A | |
| 3. 2. 5. 2. A / 4. 3. 2. 5. 2. A | Rack Power Switch | A | I | Drawing showing the size and location of the Rack Power Switch for the inspection. | L-7.5 | N/A | |
| 3. 2. 5. 2. B / 4. 3. 2. 5. 2. B | Rack Power Switch | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3. 2. 5. 2. C / 4. 3. 2. 5. 2. C | Rack Power Switch | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3. 2. 5. 3. A / | Power | A | A | Certificate of | L-3.5 | N/A | |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|------------------------------|---------------------------------------|----------------------------|------------------------|--|---------------------------|--|--|
| 4.3.2.5.3.A | Switches/Controls | | | Compliance | | | |
| 3.2.5.3. B / 4.3.2.5.3. B | Power Switches/Controls | A | A | Certificate of Compliance | L-3.5 | N/A | |
| 3.2.5.3. C / 4.3.2.5.3. C | Power Switches/Controls | A | A | Certificate of Compliance | L-3.5 | N/A | |
| 3.2.5.4 / 4.3.2.5.4 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.2.5.5. A / 4.3.2.5.5. A | Portable Equipment/Power Cords | N/A | A | Certificate of Compliance | L-3.5 | N/A | CIR does not provide any portable equipment. |
| 3.2.5.5. B / 4.3.2.5.5. B | Portable Equipment/Power Cords | N/A | A | Certificate of Compliance | L-3.5 | N/A | CIR does not provide any portable equipment. |
| 3.2.6 / 4.3.2.6 | MPLM | | NVR | N/A | N/A | N/A | |
| 3.2.6.1. A / 4.3.2.6.1. A | MPLM Electrical Power Characteristics | N/A | T ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.1. B / 4.3.2.6.1. B | MPLM Electrical Power Characteristics | N/A | A ¹ | Data cert providing plot of input voltages vs. frequency | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.1. C / 4.3.2.6.1. C | MPLM Electrical Power Characteristics | N/A | A ¹ | Data cert providing plot of input voltages vs. frequency | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.1. D / 4.3.2.6.1. D | MPLM Electrical Power Characteristics | N/A | T or A ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.1. E / 4.3.2.6.1. E | MPLM Electrical Power Characteristics | N/A | A ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.1. F / | MPLM Electrical | N/A | A ¹ | Certificate of | L-3.5 | N/A | CIR does not |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|----------------------------------|---|-------------------------------|---------------------------|---|------------------------------------|---|---|
| 4.3.2.6.1.F | Power Characteristics | | | Compliance | | | receive power from the MPLM. |
| 3.2.6.1. G / 4.3.2.6.1. G | MPLM Electrical Power Characteristics | N/A | A ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.2. A / 4.3.2.6.2. A | MPLM Electrical Power Interface | N/A | A ¹ | Analysis of test data required by 4.3.2.2.4. | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.2. B / 4.3.2.6.2. B | MPLM Electrical Power Interface | N/A | A ¹ | Analysis report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.2. C / 4.3.2.6.2. C | MPLM Electrical Power Interface | N/A | T ¹ | Test report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.2. D / 4.3.2.6.2. D | MPLM Electrical Power Interface | N/A | T&A ¹ | Analysis and test data for each integrated rack and EPCE. | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.2. E / 4.3.2.6.2. E | MPLM Electrical Power Interface | | NVR | N/A | N/A | N/A | |
| 3.2.6.2. F / 4.3.2.6.2. F | MPLM Electrical Power Interface | N/A | A ¹ | Analysis report. (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required. | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.2.1. A / 4.3.2.6.2.1. A | MPLM UIP Connector and Pin Assignments | | NVR | N/A | N/A | N/A | |
| 3.2.6.2.1. B / 4.3.2.6.2.1. B | MPLM UIP Connector and Pin Assignments | N/A | I ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|----------------------------|------------------------|--|---------------------------|--|---|
| | | | | | | | from the MPLM. |
| 3. 2. 6. 2. 1. C / 4. 3. 2. 6. 2. 1. C | MPLM UIP Connector and Pin Assignments | N/A | T ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 2. 2 / 4. 3. 2. 6. 2. 2 | Compatibility with RPC Soft Start/Stop in MPLM | N/A | T ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 2. 3. A / 4. 3. 2. 6. 2. 3. A | MPLM Surge Current | N/A | T&A ¹ | Analysis and test report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 2. 3. B / 4. 3. 2. 6. 2. 3. B | MPLM Surge Current | N/A | T&A ¹ | Analysis and test report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 2. 3. C / 4. 3. 2. 6. 2. 3. C | MPLM Surge Current | N/A | T&A ¹ | Analysis and test report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 2. 3. D / 4. 3. 2. 6. 2. 3. D | MPLM Surge Current | N/A | T&A ¹ | Analysis and test report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 2. 4 / 4. 3. 2. 6. 2. 4 | MPLM Reverse Energy/Current | N/A | A ¹ | Data cert providing a plot of worst case reverse current and potential reverse current case conditions to SSP 57000, Table 3.2.2.5-1 allowables. | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 2. 5 / 4. 3. 2. 6. 2. 5 | MPLM Payload Trip Ratings | N/A | A ¹ | Analysis report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 3. A / 4. 3. 2. 6. 3. A | MPLM Electrical Power Consumer Constraints | N/A | A ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 3. B / | MPLM Electrical | N/A | I or A ¹ | Certificate of | L-3.5 | N/A | CIR does not |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|--|----------------------------|------------------------|---|--|--|---|
| 4. 3. 2. 6. 3. B | Power Consumer Constraints | | | Compliance | | | receive power from the MPLM. |
| 3. 2. 6. 3. C / 4. 3. 2. 6. 3. C | MPLM Electrical Power Consumer Constraints | N/A | A ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 3. D / 4. 3. 2. 6. 3. D | MPLM Electrical Power Consumer Constraints | N/A | Safety ^{1, 2} | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. A / 4. 3. 2. 6. 4. A | MPLM Electromagnetic Compatibility | N/A | T&A ¹ | 1. Analysis report showing compliance with SSP 30240 Sec. 3. 2. Certificate of Compliance for the test | 1. L-7.5 2. L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. B / 4. 3. 2. 6. 4. B | MPLM Electromagnetic Compatibility | N/A | T&A&I ¹ | 1. Test report showing compliance with SSP 30245, and NSTS 1700.7B/ISS, 213 and 220. 2. Analysis report showing compliance with SSP 30245, NSTS 1700.7B/ISS, 213 and 220, and the Unique Payload Hardware ICD. 3. Certificate of Compliance for the inspection. | 1. L-7.5 2. L-7.5 3. L-3.5 | N/A | CIR does not receive power from the MPLM. |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|------------------------------------|----------------------------|--------------------------|---|---------------------------|--|---|
| 3. 2. 6. 4. C / 4. 3. 2. 6. 4. C | MPLM Electromagnetic Compatibility | N/A | T or A or I ¹ | 1. Analysis report showing compliance with SSP 30242. 2. Certificate of Compliance for the test or inspection. | 1. L-7.5 2. L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. D / 4. 3. 2. 6. 4. D | MPLM Electromagnetic Compatibility | N/A | T&A ¹ | 1. Test Report 2. Analysis report for the integrated rack based on subrack and/or rack equipment test data. | 1. L-7.5 2. L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. E / 4. 3. 2. 6. 4. E | MPLM Electromagnetic Compatibility | N/A | T or A&I ¹ | 1. A report on test results or an analysis showing compliance during functional testing. 2. Certificate of Compliance (COC) showing that the inspection identifies labeling of integrated rack and EPCE. | 1. L-7.5 2. L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. F / 4. 3. 2. 6. 4. F | MPLM Electromagnetic Compatibility | N/A | T ¹ | Test results that meet the limits of 3.2.4.6. | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. G / 4. 3. 2. 6. 4. G | MPLM Electromagnetic Compatibility | N/A | T ¹ | Test results that meet the limits of 3.2.4.7. | L-7.5 | N/A | CIR does not receive power from the MPLM. |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|------------------------------------|----------------------------|------------------------|---|---------------------------|--|---|
| 3. 2. 6. 4. H / 4. 3. 2. 6. 4. H | MPLM Electromagnetic Compatibility | N/A | T or A ¹ | 1. Detailed analysis of corona design techniques, voltage levels, and any gases plus operating environment. 2. Test report identifying test configuration plus the test results. | 1. L-7.5 2. L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. I / 4. 3. 2. 6. 4. I | MPLM Electromagnetic Compatibility | N/A | A ¹ | Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1. | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. J / 4. 3. 2. 6. 4. J | MPLM Electromagnetic Compatibility | N/A | T&A ¹ | Analysis report including applicable test data | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 4. I / 4. 3. 2. 6. 4. I | MPLM Bonding | N/A | A ¹ | Analysis report | L-7.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 5. A / 4. 3. 2. 6. 5. A | MPLM Safety Requirements | N/A | Safety ^{1,2} | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 5. B / 4. 3. 2. 6. 5. B | MPLM Safety Requirements | N/A | Safety ^{1,2} | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3. 2. 6. 5. C / 4. 3. 2. 6. 5. C | MPLM Safety Requirements | N/A | I ¹ | 1 Drawing showing the size and location of the Rack Power Switch for the inspection. 2. Certificate of Compliance. | 1. L-7.5 2. L-3.5 | N/A | CIR does not receive power from the MPLM. |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|------------------------------|---|-------------------------------|---------------------------|------------------------------|------------------------------------|---|---|
| 3.2.6.5. D / 4.3.2.6.5. D | MPLM Safety Requirements | N/A | A ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.2.6.5. E / 4.3.2.6.5. E | MPLM Safety Requirements | | NVR | N/A | N/A | N/A | |
| 3.2.6.5. F / 4.3.2.6.5. F | MPLM Safety Requirements | N/A | A ¹ | Certificate of Compliance | L-3.5 | N/A | CIR does not receive power from the MPLM. |
| 3.3 / 4.3.3 | COMMAND AND DATA HANDLING INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.3.1 / 4.3.3.1 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.3.2 / 4.3.3.2 | Word/Byte Notations, Types and Data Transmissions | | NVR | N/A | N/A | N/A | |
| 3.3.2.1 / 4.3.3.2.1 | Word/Byte Notations | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.2.2 / 4.3.3.2.2 | Data Types | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.2.3. A / 4.3.3.2.3. A | Data Transmissions | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.2.3. B / 4.3.3.2.3. B | Data Transmissions | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.2.3. C / 4.3.3.2.3. C | Data Transmissions | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.3 / 4.3.3.3 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.3.4 / 4.3.3.4 | Consultative Committee For Space Data Systems | | NVR | N/A | N/A | N/A | |
| 3.3.4.1. A / 4.3.3.4.1. A | CCSDS Data | A | T or A | Certificate of Compliance | L-3.5 | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|--|-------------------------------|---------------------------|--|------------------------------------|---|----------|
| 3.3.4.1. B / 4.3.3.4.1. B | CCSDS Data | A | T or A | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.4.1. C / 4.3.3.4.1. C | CCSDS Data | A | T or A | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.4.1.1 / 4.3.3.4.1.1 | CCSDS Data Packets | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.4.1.1.1 / 4.3.3.4.1.1.1 | CCSDS Primary Header | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.4.1.1.2. A / 4.3.3.4.1.1.2. A | CCSDS Secondary Header | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.4.1.1.2. B / 4.3.3.4.1.1.2. B | CCSDS Secondary Header | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.4.1.2 / 4.3.3.4.1.2 | CCSDS Data Field | A | T | COC for testing. | L-3.5 | N/A | |
| 3.3.4.1.3 / 4.3.3.4.1.3 | CCSDS Data Bitstream | A | T | COC for testing. | L-3.5 | N/A | |
| 3.3.4.1.4 / 4.3.3.4.1.4 | CCSDS Application Process Identification Field | | NVR | N/A | N/A | N/A | |
| 3.3.4.2 / 4.3.3.4.2 | CCSDS TIME CODES | | TITLE | N/A | N/A | N/A | |
| 3.3.4.2.1 / 4.3.3.4.2.1 | CCSDS Unsegmented Time | A | T | Certificate of Compliance for the test. | L-3.5 | N/A | |
| 3.3.4.2.2 / 4.3.3.4.2.2 | CCSDS Segmented Time | | NVR | N/A | N/A | N/A | |
| 3.3.5 / 4.3.3.5 | MIL-STD-1553B Low Rate Data Link (LRDL) | A | T | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.5.1 / 4.3.3.5.1 | MIL-STD-1553B PROTOCOL | | TITLE | N/A | N/A | N/A | |
| 3.3.5.1.1 / 4.3.3.5.1.1 | Standard Messages | A | I&T | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.5.1.2 / 4.3.3.5.1.2 | Commanding | A | T | Certificate of Compliance | L-3.5 | T&I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|------------------------------------|------------------------|----------------------------|------------------------|--|---------------------------|--|-----------------------------------|
| 3.3.5.1.3.A / 4.3.3.5.1.3.A | Health and Status Data | A | T | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.5.1.3.B / 4.3.3.5.1.3.B | Health and Status Data | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.1.3.C / 4.3.3.5.1.3.C | Health and Status Data | N/A | T | Certificate of Compliance | L-3.5 | N/A | CIR is not activated in the MPLM. |
| 3.3.5.1.3.D / 4.3.3.5.1.3.D | Health and Status Data | N/A | T | Certificate of Compliance | L-3.5 | N/A | CIR is not activated in the MPLM. |
| 3.3.5.1.3.E / 4.3.3.5.1.3.E | Health and Status Data | N/A | T | Certificate of Compliance | L-3.5 | N/A | CIR is not activated in the MPLM. |
| 3.3.5.1.4.A / 4.3.3.5.1.4.A | Safety Data | A | T&I | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.5.1.4.B / 4.3.3.5.1.4.B | Safety Data | A | T&I | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.5.1.4.1 / 4.3.3.5.1.4.1 | Cautions and Warning | | NVR | N/A | N/A | N/A | |
| 3.3.5.1.4.1.1 / 4.3.3.5.1.4.1.1 | Class 1 - Emergency | | NVR | N/A | N/A | N/A | |
| 3.3.5.1.4.1.2 / 4.3.3.5.1.4.1.2 | Class 2 - Warning | A | A&T | Data Cert providing analysis and test results. | L-7.5 | A&T | |
| 3.3.5.1.4.1.3 / 4.3.3.5.1.4.1.3 | Class 3 - Caution | A | A&T | Data Cert providing analysis and test results. | L-7.5 | A&T | |
| 3.3.5.1.4.1.4 / 4.3.3.5.1.4.1.4 | Class 4 - Advisory | A | A&T | Data Cert providing analysis and test results. | L-7.5 | A&T | |
| 3.3.5.1.5 / 4.3.3.5.1.5 | Service Requests | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.1.6 / 4.3.3.5.1.6 | Ancillary Data | | NVR | N/A | N/A | N/A | |
| 3.3.5.1.7 / 4.3.3.5.1.7 | File Transfer | A | T | Certificate of Compliance | L-3.5 | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|---|----------------------------|------------------------|---------------------------|---------------------------|--|---|
| 3.3.5.1.8 / 4.3.3.5.1.8 | Low Rate Telemetry | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.1.9 / 4.3.3.5.1.9 | Defined Mode Codes | | NVR | N/A | N/A | N/A | |
| 3.3.5.1.10 / 4.3.3.5.1.10 | Implemented Mode Codes | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.1.11 / 4.3.3.5.1.11 | Unimplemented/ Undefined Mode Codes | N/A | T | Certificate of Compliance | L-3.5 | N/A | CIR does not monitor unimplemented or undefined code modes. |
| 3.3.5.1.12 / 4.3.3.5.1.12 | Illegal Commands | A | T | Certificate of Compliance | L-3.5 | T | |
| 3.3.5.2 / 4.3.3.5.2 | MIL-STD-1553B LOW RATE DATA LINK (LRDL) INTERFACE CHARACTERISTICS | | TITLE | N/A | N/A | N/A | |
| 3.3.5.2.1 / 4.3.3.5.2.1 | LRDL REMOTE TERMINAL ASSIGNMENT | | TITLE | N/A | N/A | N/A | |
| 3.3.5.2.1.1 / 4.3.3.5.2.1.1 | LRDL CONNECTOR/PIN ASSIGNMENTS | | TITLE | N/A | N/A | N/A | |
| 3.3.5.2.1.2. A / 4.3.3.5.2.1.2. A | MIL-STD-1553B Bus A and B Connector/Pin Assignment | | NVR | N/A | N/A | N/A | |
| 3.3.5.2.1.2. B / 4.3.3.5.2.1.2. B | MIL-STD-1553B Bus A and B Connector/Pin Assignment | A | I&T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.1.2. C / 4.3.3.5.2.1.2. C | MIL-STD-1553B Bus A and B Connector/Pin Assignment | A | I&T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.1.3 / | DELETED | | N/A | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|--|----------------------------|------------------------|----------------------------|---------------------------|--|----------|
| 4.3.3.5.2.1.3 | | | | | | | |
| 3.3.5.2.1.4. A / 4.3.3.5.2.1.4. A | Remote Terminal Hardwired Address Coding | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.1.4. B / 4.3.3.5.2.1.4. B | Remote Terminal Hardwired Address Coding | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.1.4. C / 4.3.3.5.2.1.4. C | Remote Terminal Hardwired Address Coding | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.1.4. D / 4.3.3.5.2.1.4. D | Remote Terminal Hardwired Address Coding | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.2 / 4.3.3.5.2.2 | LRDL Signal Characteristics | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.3. A / 4.3.3.5.2.3. A | LRDL Cabling | A | I | Certificate of Compliance. | L-3.5 | N/A | |
| 3.3.5.2.3. B / 4.3.3.5.2.3. B | LRDL Cabling | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.5.2.4 / 4.3.3.5.2.4 | Multi-Bus Isolation | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.6 / 4.3.3.6 | MEDIUM RATE DATA LINK (MRDL) | | TITLE | N/A | N/A | N/A | |
| 3.3.6.1 / 4.3.3.6.1 | MRDL Protocol | A | I&T | Certificate of Compliance | L-3.5 | I&T | |
| 3.3.6.1.1 / 4.3.3.6.1.1 | Integrated Rack Protocols on the MRDL | A | I&T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.6.1.2. A / 4.3.3.6.1.2. A | MRDL Address | A | A&T | Certificate of Compliance | L-3.5 | A&T | |
| 3.3.6.1.2. B / 4.3.3.6.1.2. B | MRDL Address | A | A&T | Certificate of Compliance | L-3.5 | T | |
| 3.3.6.1.2. C / 4.3.3.6.1.2. C | MRDL Address | A | T | Certificate of Compliance | L-3.5 | T | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|----------------------------------|---|-----------------------|------------------------|---------------------------|---------------------------|--|---------------|
| 3.3.6.1.3. A / 4.3.3.6.1.3. A | ISPR MRDL Connectivity | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.6.1.3. B / 4.3.3.6.1.3. B | ISPR MRDL Connectivity | E | T | Certificate of Compliance | L-3.5 | N/A | 57217-NA-0055 |
| 3.3.6.1.3. C / 4.3.3.6.1.3. C | ISPR MRDL Connectivity | E | T | Certificate of Compliance | L-3.5 | N/A | 57217-NA-0055 |
| 3.3.6.1.4. A / 4.3.3.6.1.4. A | MRDL Connector/Pin Assignments | | NVR | N/A | N/A | N/A | |
| 3.3.6.1.4. B / 4.3.3.6.1.4. B | MRDL Connector/Pin Assignments | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.6.1.4. C / 4.3.3.6.1.4. C | MRDL Connector/Pin Assignments | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.6.1.5 / 4.3.3.6.1.5 | MRDL Signal Characteristics | A | I&T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.6.1.6 / 4.3.3.6.1.6 | MRDL Cable Characteristics | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.7 / 4.3.3.7 | High Rate Data Link (HRDL) | | NVR | N/A | N/A | N/A | |
| 3.3.7.1 / 4.3.3.7.1 | Payload to High Rate Frame Multiplexer (HRFM) Protocols | A | T&I | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.7.1.1 / 4.3.3.7.1.1 | CCSDS Packet Protocol | | NVR | N/A | N/A | N/A | |
| 3.3.7.1.1.1 / 4.3.3.7.1.1.1 | Packet Data Frames | A | T&I | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.7.1.1.2 / 4.3.3.7.1.1.2 | Packet Data Rates | A | T&I | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.7.1.1.3 / 4.3.3.7.1.1.3 | Packet Format | A | T&I | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.7.1.2 / 4.3.3.7.1.2 | Bitstream Protocol | | NVR | N/A | N/A | N/A | |
| 3.3.7.1.2.1 / 4.3.3.7.1.2.1 | Data Frames | A | T&I | Certificate of Compliance | L-3.5 | T&I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|--|----------------------------|------------------------|--|---------------------------|--|--|
| 3.3.7.1.2.2 / 4.3.3.7.1.2.2 | Data Rates | A | T&I | Certificate of Compliance | L-3.5 | T&I | |
| 3.3.7.2 / 4.3.3.7.2 | HRDL Interface Characteristics | | NVR | N/A | N/A | N/A | |
| 3.3.7.2.1 / 4.3.3.7.2.1 | Physical Signaling | A | T&A | Data Cert providing rates, signal coding, and control signals. | L-7.5 | T&A | |
| 3.3.7.2.1.1. A / 4.3.3.7.2.1.1. A | DELETED | | N/A | N/A | N/A | N/A | |
| 3.3.7.2.1.1. B / 4.3.3.7.2.1.1. B | Physical Signaling Date Rates | A | T | Data Cert providing rates, signal coding, and control signals. | L-7.5 | T | |
| 3.3.7.2.1.1. C / 4.3.3.7.2.1.1. C | Physical Signaling Date Rates | | NVR | N/A | N/A | N/A | |
| 3.3.7.2.2 / 4.3.3.7.2.2 | Encoding | A | T | Data Cert providing rates, signal coding, and control signals. | L-7.5 | T | |
| 3.3.7.3 / 4.3.3.7.3 | INTEGRATED RACK HRDL OPTICAL POWER | | TITLE | N/A | N/A | N/A | |
| 3.3.7.3.1 / 4.3.3.7.3.1 | Integrated Rack HRDL Transmitted Optical Power | A | T | Certificate of Compliance | L-3.5 | T | |
| 3.3.7.3.2 / 4.3.3.7.3.2 | Integrated Rack HRDL Received Optical Power | N/A | T | Certificate of Compliance | L-3.5 | T | CIR does not have a receiver for optical power |
| 3.3.7.4 / 4.3.3.7.4 | HRDL Fiber Optical Cable | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.7.5 / 4.3.3.7.5 | HRDL Fiber Optical Cable Bend Radius | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.7.6. A / 4.3.3.7.6. A | HRDL Connectors and Fiber | | NVR | N/A | N/A | N/A | |
| 3.3.7.6. B / | HRDL Connectors and | A | I | Certificate of | L-3.5 | I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|----------------------------|---------------------------|----------------------------|------------------------|---------------------------|---------------------------|--|---|
| 4.3.3.7.6.B | Fiber | | | Compliance | | | |
| 3.3.7.6.C / 4.3.3.7.6.C | HRDL Connectors and Fiber | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.7.6.D / 4.3.3.7.6.D | HRDL Connectors and Fiber | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.7.7 / 4.3.3.7.7 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.3.7.8 / 4.3.3.7.8 | HRDL State | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.3.8.A / 4.3.3.8.A | Laptop Computers | A | I or A | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.8.B / 4.3.3.8.B | Laptop Computers | A | D | Certificate of Compliance | L-3.5 | D | |
| 3.3.8.1.A / 4.3.3.8.1.A | Payload Rack Laptop | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize a unique payload laptop. |
| 3.3.8.1.B / 4.3.3.8.1.B | Deleted | | N/A | N/A | N/A | N/A | |
| 3.3.8.1.C / 4.3.3.8.1.C | Deleted | | N/A | N/A | N/A | N/A | |
| 3.3.8.1.D / 4.3.3.8.1.D | Payload Rack Laptop | N/A | I | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize a unique payload laptop. |
| 3.3.8.1.E / 4.3.3.8.1.E | Deleted | N/A | N/A | N/A | N/A | N/A | |
| 3.3.8.1.F / 4.3.3.8.1.F | Deleted | N/A | N/A | N/A | N/A | N/A | |
| 3.3.8.1.G / 4.3.3.8.1.G | Deleted | N/A | N/A | N/A | N/A | N/A | |
| 3.3.8.1.H / 4.3.3.8.1.H | Deleted | N/A | N/A | N/A | N/A | N/A | |
| 3.3.8.1.I / 4.3.3.8.1.I | Payload Rack Laptop | N/A | I | Certificate of Compliance | L-12 | N/A | CIR does not utilize a unique |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------|--|----------------------------|------------------------|---------------------------|---------------------------|--|----------------|
| | | | | | | | payload laptop |
| 3.3.8.2 4.3.3.8.2 | PCS | N/A | NVR | N/A | N/A | N/A | |
| 3.3.8.3 4.3.3.8.3 | | | NVR | N/A | N/A | N/A | |
| 3.3.9 / 4.3.3.9 | UOP | | NVR | N/A | N/A | N/A | |
| 3.3.10 / 4.3.3.10 | POWER SWITCH, SMOKE DETECTOR, SMOKE INDICATOR, AND INTEGRATED RACK FAN INTERFACES | | TITLE | N/A | N/A | N/A | |
| 3.3.10.1 / 4.3.3.10.1 | Rack Power Switch Interfaces | A | T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.10.2 / 4.3.3.10.2 | Smoke Detector Interfaces | | NVR | N/A | N/A | N/A | |
| 3.3.10.2.1 / 4.3.3.10.2.1 | Analog Interface Characteristics | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.10.2.2 / 4.3.3.10.2.2 | Discrete Command Built-In-Test Interface Characteristics | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.3.10.2.3 / 4.3.3.10.2.3 | Smoke Indicator Electrical Interfaces | A | A&T | Certificate of Compliance | L-3.5 | N/A | |
| 3.3.10.2.4 / 4.3.3.10.2.4 | Fan Ventilation Status Electrical Interfaces | E | I | Certificate of Compliance | L-3.5 | N/A | 57217-NA-0041A |
| 3.3.10.3. A / 4.3.3.10.3. A | Rack Power Switch/Fire Detection Support Interface Connector | | NVR | N/A | N/A | N/A | |
| 3.3.10.3. B / 4.3.3.10.3. B | Rack Power Switch/Fire Detection Support Interface | A | I | Certificate of Compliance | L-3.5 | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|----------------------------|------------------------|--|---------------------------|--|----------|
| | Connector | | | | | | |
| 3. 3.10. 3. C / 4. 3. 3.10. 3. C | Rack Power Switch/Fire Detection Support Interface Connector | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3. 4. / 4. 3. 4 | Payload NTSC Video and Audio Interface Requirement | | NVR | N/A | N/A | N/A | |
| 3. 4. 1 / 4. 3. 4. 1 | PAYLOAD NTSC VIDEO INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 4. 1. 1. A / 4. 3. 4. 1. 1. A | Payload NTSC Video Characteristics for Fiber Optic Video | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 4. 1. 1. B / 4. 3. 4. 1. 1. B | Deleted | | N/A | N/A | N/A | N/A | |
| 3. 4. 1. 1. C / 4. 3. 4. 1. 1. C | Payload NTSC Video Characteristics for Fiber Optic Video | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 4. 1. 2 / 4. 3. 4. 1. 2 | NTSC FIBER OPTIC VIDEO | | TITLE | N/A | N/A | N/A | |
| 3. 4. 1. 2. 1. A / 4. 3. 4. 1. 2. 1. A | Pulse Frequency Modulation NTSC Fiber Optic Video Characteristics | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 4. 1. 2. 1. B / 4. 3. 4. 1. 2. 1. B | Pulse Frequency Modulation NTSC Fiber Optic Video Characteristics | A | T | Data providing PFM fiber optic video signal characteristics. | 7.5 | T | |
| 3. 4. 1. 2. 2 / 4. 3. 4. 1. 2. 2 | Integrated Rack NTSC PFM Video Transmitted Optical Power | A | T | Certificate of Compliance | L-3.5 | T | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|----------------------------|------------------------|--|---------------------------|--|--------------------------------------|
| 3. 4. 1. 2. 3 / 4. 3. 4. 1. 2. 3 | Integrated Rack NTSC PFM Video and Sync Signal Received Optical Power | N/A | T | Certificate of Compliance | L-3.5 | T | CIR does not receive video signals. |
| 3. 4. 1. 2. 4 / 4. 3. 4. 1. 2. 4 | Fiber Optic Cable Characteristics | A | I | Data providing electrical video characteristics. | 7.5 | N/A | |
| 3. 4. 1. 2. 5 / 4. 3. 4. 1. 2. 5 | PFM NTSC Video Fiber Optic Cable Bend Radius | A | I | Certificate of Compliance | L-3.5 | N/A | |
| 3. 4. 1. 2. 6 / 4. 3. 4. 1. 2. 6 | DELETED | | N/A | N/A | N/A | N/A | |
| 3. 4. 1. 2. 7. A / 4. 3. 4. 1. 2. 7. A | PFM NTSC Optical Connector/Pin Assignments | | NVR | N/A | N/A | N/A | |
| 3. 4. 1. 2. 7. B / 4. 3. 4. 1. 2. 7. B | PFM NTSC Optical Connector/Pin Assignments | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 4. 1. 2. 7. C / 4. 3. 4. 1. 2. 7. C | PFM NTSC Optical Connector/Pin Assignments | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 4. 1. 3 / 4. 3. 4. 1. 3 | NTSC ELECTRICAL VIDEO INTERFACES | | TITLE | N/A | N/A | N/A | |
| 3. 4. 1. 3. 1 / 4. 3. 4. 1. 3. 1 | Cables | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not interface with the JEM. |
| 3. 4. 1. 3. 2 / 4. 3. 4. 1. 3. 2 | Signal Standard | N/A | T | Certificate of Compliance | L-3.5 | T | CIR does not interface with the JEM. |
| 3. 4. 1. 3. 3 / 4. 3. 4. 1. 3. 3 | Interface Circuit | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not interface with the JEM. |
| 3. 4. 1. 3. 4 / 4. 3. 4. 1. 3. 4 | Cross Talk | N/A | T | Certificate of Compliance | L-3.5 | T | CIR does not interface with the |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|---|----------------------------|------------------------|---------------------------|---------------------------|--|----------|
| | | | | | | | JEM. |
| 3. 4. 1. 4. A / 4. 3. 4. 1. 4. A | NTSC Electrical Connector/Pin Assignments | | NVR | N/A | N/A | N/A | |
| 3. 4. 1. 4. B / 4. 3. 4. 1. 4. B | NTSC Electrical Connector/Pin Assignments | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 4. 1. 4. C / 4. 3. 4. 1. 4. C | NTSC Electrical Connector/Pin Assignments | A | I | Certificate of Compliance | L-3.5 | I | |
| 3. 4. 2 / 4. 3. 4. 2 | U.S. Element Audio Interface Requirements | | NVR | N/A | N/A | N/A | |
| 3. 5 / 4. 3. 5 | THERMAL CONTROL INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 5. 1 / 4. 3. 5. 1 | INTERNAL THERMAL CONTROL SYSTEM (ITCS) INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 5. 1. 1. A / 4. 3. 5. 1. 1. A | Physical Interface | | NVR | N/A | N/A | N/A | |
| 3. 5. 1. 1. B / 4. 3. 5. 1. 1. B | Physical Interface | | NVR | N/A | N/A | N/A | |
| 3. 5. 1. 2. A / 4. 3. 5. 1. 2. A | DELETED | | N/A | N/A | N/A | N/A | |
| 3. 5. 1. 2. B / 4. 3. 5. 1. 2. B | ITCS Fluid Charging and Expansion | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 5. 1. 2. C / 4. 3. 5. 1. 2. C | ITCS Fluid Charging and Expansion | A | I&A | Certificate of Compliance | L-3.5 | I&A | |
| 3. 5. 1. 2. D / 4. 3. 5. 1. 2. D | ITCS Fluid Charging and Expansion | A | I&A | Certificate of Compliance | L-3.5 | I&A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|-----------------------------------|-----------------------|------------------------|--|---------------------------|--|--|
| 3. 5. 1. 2. E / 4. 3. 5. 1. 2. E | ITCS Fluid Charging and Expansion | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 5. 1. 3 / 4. 3. 5. 1. 3 | ITCS PRESSURE DROP | | TITLE | N/A | N/A | N/A | |
| 3. 5. 1. 3. 1. A / 4. 3. 5. 1. 3. 1. A | On-Orbit Interfaces | A | T | Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour). | L-7.5 | T&A | |
| 3. 5. 1. 3. 1. B / 4. 3. 5. 1. 3. 1. B | On-Orbit Interfaces | A | T | Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour). | L-7.5 | T&A | |
| 3. 5. 1. 3. 1. C / 4. 3. 5. 1. 3. 1. C | On-Orbit Interfaces | N/A | T | Data Cert showing that the rack controls the flow rate and operates normally at flow rates measured at the design pressure drop, the design pressure drop +1 psid, and the design pressure drop -1 psid. | L-7.5 | A | No Simultaneous Cooling |
| 3. 5. 1. 3. 2 / 4. 3. 5. 1. 3. 2 | MPLM Interfaces | N/A | T ¹ | Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour). | L-7.5 | N/A | CIR does not require active cooling in the MPLM. |
| 3. 5. 1. 4. A / 4. 3. 5. 1. 4. A | Coolant Flow Rate - MTL | A | T or A | Data Cert providing power data (in kW) and flow rate (in lbm per hour) for each mode of operation in tabular form. | L-7.5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|----------------------------------|----------------------------|------------------------|---|---------------------------|--|-------------------------------|
| 3. 5. 1. 4. B / 4. 3. 5. 1. 4. B | Coolant Flow Rate - LTL | N/A | T or A | Data Cert providing power data (in kW) and flow rate (in lbm per hour) for each mode of operation in tabular form. | L-7.5 | A | CIR does not utilize the LTL. |
| 3. 5. 1. 5. A / 4. 3. 5. 1. 5. A | Coolant Supply Temperature - MTL | | NVR | N/A | N/A | N/A | |
| 3. 5. 1. 5. B / 4. 3. 5. 1. 5. B | Coolant Supply Temperature - LTL | | NVR | N/A | N/A | N/A | |
| 3. 5. 1. 6. A / 4. 3. 5. 1. 6. A | Coolant Return Temperature | E | T&A | Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form. | L-7.5 | A | 57217-NA-0011 |
| 3. 5. 1. 6. B / 4. 3. 5. 1. 6. B | Coolant Return Temperature | E | A | Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form. | L-7.5 | A | 57217-NA-0011 |
| 3. 5. 1. 6. C / 4. 3. 5. 1. 6. C | Coolant Return Temperature | A | T&A | Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form. | L-7.5 | A | |
| 3. 5. 1. 6. D / 4. 3. 5. 1. 6. D | Coolant Return Temperature | N/A | T&A | Data Cert providing return coolant temperature (in | L-7.5 | A | CIR does not utilize the LTL. |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|---|----------------------------|------------------------|---|---------------------------|--|--|
| | | | | Fahrenheit) and power data (in kW) for each mode of operation in tabular form. | | | |
| 3. 5. 1. 7. A / 4. 3. 5. 1. 7. A | Coolant Maximum Design Pressure - MTL | E | T | Certificate of Compliance | L-7.5 | T&A | 57217-NA-0034 |
| 3. 5. 1. 7. B / 4. 3. 5. 1. 7. B | Coolant Maximum Design Pressure - LTL | N/A | T | Certificate of Compliance | L-7.5 | T&A | CIR does not utilize the LTL. |
| 3. 5. 1. 7. C / 4. 3. 5. 1. 7. C | Coolant Maximum Design Pressure - MPLM Temperature Loop | N/A | T ¹ | Certificate of Compliance | L-7.5 | N/A | CIR does not require active cooling in the MPLM. |
| 3. 5. 1. 8 / 4. 3. 5. 1. 8 | Fail Safe Design | A | A or A&T | Certificate of Compliance | L-3.5 | A or A&T | |
| 3. 5. 1. 9. A / 4. 3. 5. 1. 9. A | Leakage | A | T | Data Cert providing leakage test results (in scc per hour). | L-7.5 | T&A | |
| 3. 5. 1. 9. B / 4. 3. 5. 1. 9. B | Leakage | N/A | T | Data Cert providing leakage test results (in scc per hour). | L-7.5 | T&A | CIR does not operate in the MPLM. |
| 3. 5. 1.10 / 4. 3. 5. 1.10 | Quick-Disconnect Air Inclusion | A | T or A | Certificate of Compliance | L-3.5 | T or A | |
| 3. 5. 1.11 / 4. 3. 5. 1.11 | Rack Front Surface Temperature | A | T or A | Certificate of Compliance | L-3.5 | T or A | |
| 3. 5. 1.12 / 4. 3. 5. 1.12 | Cabin Air Heat Leak | A | A | Data Cert providing integrated rack-to-cabin heat leak analysis results. | L-7.5 | A | |
| 3. 5. 1.13 / 4. 3. 5. 1.13 | MPLM Cabin Air Cooling | N/A | A ¹ | Data Cert providing analysis results (in watts) that the cabin air cooling (heat absorbed) of the integrated rack is within limits. | L-7.5 | N/A | CIR does not operate in the MPLM. |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|---|----------------------------|------------------------|--|---------------------------|--|--|
| 3. 5. 1.14. A / 4. 3. 5. 1.14. A | Simultaneous Cooling | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not utilize simultaneous cooling. |
| 3. 5. 1.14. B / 4. 3. 5. 1.14. B | Simultaneous Cooling | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not utilize simultaneous cooling. |
| 3. 5. 1.15 / 4. 3. 5. 1.15 | Control System Time Constant | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 5. 1.16 / 4. 3. 5. 1.16 | Payload Coolant Quantity | A | T or A | Data Cert providing integrated rack coolant quantity (in liters normalized to the 16.1 degrees C (61 degrees F) reference temperature as provided in the Unique Payload Hardware ICD). | L-7.5 | T or A | |
| 3. 6 / 4. 3. 6 | VACUUM SYSTEM REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 6. 1 / 4. 3. 6. 1 | VACUUM EXHAUST SYSTEM (VES)/WASTE GAS SYSTEM (WGS) REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 6. 1. 1 / 4. 3. 6. 1. 1 | VES/WGS Physical Interface | | NVR | N/A | N/A | N/A | |
| 3. 6. 1. 2. A / 4. 3. 6. 1. 2. A | Input Pressure Limit | A | T&A | Certificate of Compliance | L-3.5 | T&A | |
| 3. 6. 1. 2. B / 4. 3. 6. 1. 2. B | Input Pressure Limit | A | T&A | Certificate of Compliance | L-3.5 | T&A | |
| 3. 6. 1. 2. C / 4. 3. 6. 1. 2. C | Input Pressure Limit | A | A | Certificate of Compliance | L-3.5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--------------------------|----------------------------|------------------------|--|---------------------------|--|----------|
| 3. 6. 1. 3 / 4. 3. 6. 1. 3 | Input Temperature Limit | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 6. 1. 4 / 4. 3. 6. 1. 4 | Input Dewpoint Limit | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 6. 1. 5. A / 4. 3. 6. 1. 5. A | Acceptable Exhaust Gases | A | T or A | Data Cert providing constituents of vented gas, volume, concentration, temperature, and pressure | L-7.5 | T or A | |
| 3. 6. 1. 5. B / 4. 3. 6. 1. 5. B | Acceptable Exhaust Gases | A | A | Data Cert showing the integrated rack gases vented to the ISS VES/WGS are non-reactive with other vent gas mixture constituents | L-7.5 | A | |
| 3. 6. 1. 5. C / 4. 3. 6. 1. 5. C | Acceptable Exhaust Gases | A | A | Data Cert showing that integrated racks venting in the ISS VES/WGS provide a means to remove gases that should adhere to the VES/WGS tubing walls. | L-7.5 | A | |
| 3. 6. 1. 5. D / 4. 3. 6. 1. 5. D | Acceptable Exhaust Gases | A | A | Data Cert Showing that all particulates larger than 100 micrometers are removed prior to venting to the VES/WGS. | L-7.5 | A | |
| 3. 6. 1. 5. 1. A / 4. 3. 6. 1. 5. 1. A | Acceptable Gases List | | NVR | N/A | N/A | N/A | |
| 3. 6. 1. 5. 1. B / 4. 3. 6. 1. 5. 1. B | Acceptable Gases List | | NVR | N/A | N/A | N/A | |
| 3. 6. 1. 5. 1. C / 4. 3. 6. 1. 5. 1. C | Acceptable Gases List | | NVR | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|--|----------------------------|------------------------|---|---------------------------|--|---------------|
| 3. 6. 1. 5. 2 / 4. 3. 6. 1. 5. 2 | External Contamination Control | A | A | Data Cert providing the required list of vented gas characteristics (vented gas constituents, mass, temperature, concentration, maximum particulate size, maximum flow rate, and pressure). | L-7.5 | A | |
| 3. 6. 1. 6 / 4. 3. 6. 1. 6 | Payload Vacuum System Access Valve | A | I&A | Certificate of Compliance | L-3.5 | I&A | |
| 3. 6. 1. 7. A / 4. 3. 6. 1. 7. A | Limit Amount of Vented Gases | E | A | Analysis report showing that the amount of gas vented is below either the mass limit or pressure-volume limit for any 9-minute period. | L-7.5 | A | 57217-NA-0034 |
| 3. 6. 1. 7. B / 4. 3. 6. 1. 7. B | Limit Amount of Vented Gases | E | A | Analysis report showing that the amount of gas vented is below either the mass limit or pressure-volume limit for any 110-minute period. | L-7.5 | A | 57217-NA-0034 |
| 3. 6. 2 / 4. 3. 6. 2 | VACUUM RESOURCE SYSTEM (VRS)/VACUUM VENT SYSTEM (VVS) REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 6. 2. 1 / 4. 3. 6. 2. 1 | VRS/VVS Physical Interface | | NVR | N/A | N/A | N/A | |
| 3. 6. 2. 2. A / 4. 3. 6. 2. 2. A | Input Pressure Limit | A | T | Certificate of Compliance | L-3.5 | T | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|--|----------------------------|------------------------|---|---------------------------|--|----------------|
| 3. 6. 2. 2. B / 4. 3. 6. 2. 2. B | Input Pressure Limit | A | T&A | Certificate of Compliance | L-3.5 | T&A | |
| 3. 6. 2. 2. C / 4. 3. 6. 2. 2. C | Input Pressure Limit | A | A | Certificate of Compliance | L-3.5 | A | |
| 3. 6. 2. 3 / 4. 3. 6. 2. 3 | VRS/VVS Through-Put Limit | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 6. 2. 4 / 4. 3. 6. 2. 4 | Acceptable Gases | | NVR | N/A | N/A | N/A | |
| 3. 6. 3 / 4. 3. 6. 3 | Vacuum Outgassing Requirements | E | I | Certificate of Compliance | L-3.5 | I | 57217-NA-0038 |
| 3. 7 / 4. 3. 7 | PRESSURIZED GASES INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 7. 1 / 4. 3. 7. 1 | NITROGEN INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 7. 1. 1. A / 4. 3. 7. 1. 1. A | Nitrogen Interface Control | A | T | Certificate of Compliance | L-3.5 | T | |
| 3. 7. 1. 1. B / 4. 3. 7. 1. 1. B | Nitrogen Interface Control | A | T | Certificate of Compliance | L-3.5 | T&A | |
| 3. 7. 1. 2 / 4. 3. 7. 1. 2 | Nitrogen Interface MDP | A | T&A | Certificate of Compliance | L-7.5 | T&A | |
| 3. 7. 1. 3 / 4. 3. 7. 1. 3 | Nitrogen Interface Temperature | | NVR | N/A | N/A | N/A | |
| 3. 7. 1. 4 / 4. 3. 7. 1. 4 | Nitrogen Leakage | E | T or T&A | Data Cert providing leakage results in units of each gas used (in sec per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be | L-7.5 | T or T&A | 57202-NA-0033B |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|---------------------------------------|----------------------------|------------------------|---|---------------------------|--|---|
| | | | | provided. | | | |
| 3. 7. 1. 5 / 4. 3. 7. 1. 5 | Nitrogen Physical Interface | | NVR | N/A | N/A | N/A | |
| 3. 7. 2 / 4. 3. 7. 2 | ARGON INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 7. 2. 1. A / 4. 3. 7. 2. 1. A | Argon Interface Control | N/A | T | Certificate of Compliance | L-3.5 | T&A | CIR does not utilize the Argon Interface. |
| 3. 7. 2. 1. B / 4. 3. 7. 2. 1. B | Argon Interface Control | N/A | T | Certificate of Compliance | L-3.5 | T&A | CIR does not utilize the Argon Interface. |
| 3. 7. 2. 2 / 4. 3. 7. 2. 2 | Argon Interface MDP | N/A | T&A | Certificate of Compliance | L-7.5 | T&A | CIR does not utilize the Argon Interface. |
| 3. 7. 2. 3 / 4. 3. 7. 2. 3 | Argon Interface Temperature | | NVR | N/A | N/A | N/A | |
| 3. 7. 2. 4 / 4. 3. 7. 2. 4 | Argon Leakage | N/A | T or T&A | Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided. | L-7.5 | T or T&A | CIR does not utilize the Argon Interface. |
| 3. 7. 2. 5 / 4. 3. 7. 2. 5 | Argon Physical Interface | | NVR | N/A | N/A | N/A | |
| 3. 7. 3 / 4. 3. 7. 3 | CARBON DIOXIDE INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 7. 3. 1. A / 4. 3. 7. 3. 1. A | Carbon Dioxide Interface Control | N/A | T | Certificate of Compliance | L-3.5 | T | CIR does not utilize the CO ² |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|--------------------------------------|-----------------------|------------------------|---|---------------------------|--|---|
| | | | | | | | Interface. |
| 3. 7. 3. 1. B / 4. 3. 7. 3. 1. B | Carbon Dioxide Interface Control | N/A | T | Certificate of Compliance | L-3.5 | T&A | CIR does not utilize the CO ² Interface. |
| 3. 7. 3. 2 / 4. 3. 7. 3. 2 | Carbon Dioxide Interface MDP | N/A | T&A | Certificate of Compliance | L-7.5 | T&A | CIR does not utilize the CO ² Interface. |
| 3. 7. 3. 3 / 4. 3. 7. 3. 3 | Carbon Dioxide Interface Temperature | | NVR | N/A | N/A | N/A | |
| 3. 7. 3. 4 / 4. 3. 7. 3. 4 | Carbon Dioxide Leakage | N/A | T or T&A | Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided. | L-7.5 | T or T&A | CIR does not utilize the CO ² Interface. |
| 3. 7. 3. 5 / 4. 3. 7. 3. 5 | Carbon Dioxide Physical Interface | | NVR | N/A | N/A | N/A | |
| 3. 7. 4 / 4. 3. 7. 4 | HELIUM INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3. 7. 4. 1. A / 4. 3. 7. 4. 1. A | Helium Interface Control | N/A | T | Certificate of Compliance | L-3.5 | T | CIR does not utilize the Helium Interface. |
| 3. 7. 4. 1. B / 4. 3. 7. 4. 1. B | Helium Interface Control | N/A | T | Certificate of Compliance | L-3.5 | T&A | CIR does not utilize the Helium Interface. |
| 3. 7. 4. 2 / 4. 3. 7. 4. 2 | Helium Interface MDP | N/A | T&A | Certificate of Compliance | L-7.5 | T&A | CIR does not utilize the Helium Interface. |
| 3. 7. 4. 3 / | Helium Interface | | NVR | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|------------------------------|--|-----------------------|------------------------|---|---------------------------|--|---|
| 4.3.7.4.3 | Temperature | | | | | | |
| 3.7.4.4 / 4.3.7.4.4 | Helium Leakage | N/A | T or T&A | Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided. | L-7.5 | T or T&A | CIR does not utilize the Helium Interface. |
| 3.7.4.5 / 4.3.7.4.5 | Helium Physical Interface | | NVR | N/A | N/A | N/A | |
| 3.7.5 / 4.3.7.5 | Pressurized Gas Systems | A | A | Data Cert providing maximum credible leak rate (in slpm) for each bottle. | L-7.5 | A | |
| 3.7.6 / 4.3.7.6 | Manual Valves | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.8 / 4.3.8 | PAYLOAD SUPPORT SERVICES INTERFACES REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.8.1 / 4.3.8.1 | POTABLE WATER | | TITLE | N/A | N/A | N/A | |
| 3.8.1.1 / 4.3.8.1.1 | Potable Water Interface Connection | | NVR | N/A | N/A | N/A | |
| 3.8.1.2 / 4.3.8.1.2 | Potable Water Interface Pressure | N/A | T | Certificate of Compliance | L-3.5 | T | CIR does not utilize the potable water interface. |
| 3.8.1.3. A / 4.3.8.1.3. A | Potable Water Use | N/A | A | Data Cert providing integrated rack water consumption analysis summary. | L-7.5 | A | CIR does not utilize the potable water interface. |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|------------------------------|---|----------------------------|------------------------|--|---------------------------|--|--|
| 3.8.1.3. B / 4.3.8.1.3. B | Potable Water Use | N/A | A | Data Cert providing integrated rack water consumption analysis summary. | L-7.5 | A | CIR does not utilize the potable water interface. |
| 3.9 / 4.3.9 | ENVIRONMENT INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.9.1 / 4.3.9.1 | ATMOSPHERE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.9.1.1 / 4.3.9.1.1 | Pressure | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.9.1.2 / 4.3.9.1.2 | Temperature | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.9.1.3 / 4.3.9.1.3 | Humidity | A | A | Analysis report including: - Description of condensation collection system. - Illustration of all components or surfaces where condensation is most likely to occur. - Upper humidity limit in terms of dewpoint. - All rack surface temperature | L-7.5 | A | |
| 3.9.2 / 4.3.9.2 | INTEGRATED RACK USE OF CABIN ATMOSPHERE | | TITLE | N/A | N/A | N/A | |
| 3.9.2.1. A / 4.3.9.2.1. A | Active Air Exchange | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not exchange air with the cabin atmosphere. |
| 3.9.2.1. B / | Active Air Exchange | N/A | A | Certificate of | L-3.5 | A | CIR is not aisle |

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TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|----------------------------|---|-------------------------------|---------------------------|--|------------------------------------|---|---|
| 4.3.9.2.1.B | | | | Compliance | | | mounted. |
| 3.9.2.2 / 4.3.9.2.2 | Oxygen Consumption | A | A | Data Cert providing the integrated rack oxygen consumption analysis results. | L-7.5 | A | |
| 3.9.2.3.A / 4.3.9.2.3 | Chemical Releases | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.9.2.3.B / 4.3.9.2.3.B | Chemical Releases | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.9.3 / 4.3.9.3 | RADIATION REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.9.3.1 / 4.3.9.3.1 | Integrated Rack Contained or Generated Ionizing Radiation | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.9.3.2 / 4.3.9.3.2 | Ionizing Radiation Dose | | NVR | N/A | N/A | N/A | |
| 3.9.3.3 / 4.3.9.3.3 | Single Event Effect (SEE) Ionizing Radiation | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.9.3.4 / 4.3.9.3.4 | Lab Window Rack Location Radiation Requirements | | NVR | N/A | N/A | N/A | |
| 3.9.3.4.1 / 4.3.9.3.4.1 | Window Rack Infrared Radiation Requirements | N/A | T | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the lab window location. |
| 3.9.3.4.2 / 4.3.9.3.4.2 | Window Rack Ultraviolet Radiation Requirements | N/A | T | Certificate of Compliance | L-3.5 | N/A | CIR does not utilize the lab window location. |
| 3.9.4 / 4.3.9.4 | Additional Environmental Conditions | | NVR | N/A | N/A | N/A | |
| 3.10 / 4.3.10 | FIRE PROTECTION INTERFACE | | TITLE | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|-----------------------|------------------------|--|---------------------------|--|----------|
| | REQUIREMENTS | | | | | | |
| 3.10. 1 / 4. 3.10. 1 | Fire Prevention | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.10. 2 / 4. 3.10. 2 | Payload Monitoring and Detection Requirements | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.10. 2. 1 / 4. 3.10. 2. 1 | SMOKE DETECTION | | TITLE | N/A | N/A | N/A | |
| 3.10. 2. 1. 1. A / 4. 3.10. 2. 1. 1. A | Smoke Detector | A | I | COC for ISS provided smoke detectors or Analysis report for PD provided smoke detectors. | L-7.5 | N/A | |
| 3.10. 2. 1. 1. B / 4. 3.10. 2. 1. 1. B | Smoke Detector | A | I&D | Certificate of Compliance | L-3.5 | N/A | |
| 3.10. 2. 1. 2 / 4. 3.10. 2. 1. 2 | Forced Air Circulation Indication | A | T | Certificate of Compliance for forced air circulation. | L-3.5 | N/A | |
| 3.10. 2. 1. 3. A / 4. 3.10. 2. 1. 3. A | Fire Detection Indicator | A | T&I | Drawing and a COC showing the size and location of the fire detection indicator. | L-7.5 | N/A | |
| 3.10. 2. 1. 3. B / 4. 3.10. 2. 1. 3. B | Fire Detection Indicator | A | I | Certificate of Compliance for fire detection indicators and sensors. | L-3.5 | N/A | |
| 3.10. 2. 2 / 4. 3.10. 2. 2 | PARAMETER MONITORING | | TITLE | N/A | N/A | N/A | |
| 3.10. 2. 2. 1 / 4. 3.10. 2. 2. 1 | Parameter Monitoring Use | A | I&A | Certificate of Compliance | L-3.5 | A&I | |
| 3.10. 2. 2. 2 / 4. 3.10. 2. 2. 2 | PARAMETER MONITORING RESPONSE | | TITLE | N/A | N/A | N/A | |
| 3.10. 2. 2. 2. 1. A / | Parameter Monitoring | A | T | Test report including test | L-7.5 | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|----------------------------|------------------------|--|---------------------------|--|--|
| 4. 3.10. 2. 2. 2. 1. A | in Subrack | | | data. | | | |
| 3.10. 2. 2. 2. 1. B / 4. 3.10. 2. 2. 2. 1. B | Parameter Monitoring in Subrack | A | T&A | Test report including test data. | L-7.5 | T&A | |
| 3.10. 2. 2. 2. 1. C / 4. 3.10. 2. 2. 2. 1. C | Parameter Monitoring in Subrack | A | T&A | Test report including test data. | L-7.5 | T & A | |
| 3.10. 2. 2. 2. 2. A / 4. 3.10. 2. 2. 2. 2. A | Parameter Monitoring in Integrated Rack | A | T | Test report including test data. | L-7.5 | N/A | |
| 3.10. 2. 2. 2. 2. B / 4. 3.10.2. 2. 2. 2. B | Parameter Monitoring in Integrated Rack | A | T | Test report including test data. | L-7.5 | N/A | |
| 3.10. 2. 2. 2. 2. C / 4. 3.10.2. 2. 2. 2. C | Parameter Monitoring in Integrated Rack | A | T&A | Test report including test data. | L-7.5 | N/A | |
| 3.10. 3 / 4. 3.10. 3 | Fire Suppression | | NVR | N/A | N/A | N/A | |
| 3.10. 3. 1. A / 4. 3.10. 3. 1. A | Portable Fire Extinguisher | A | I&A | 1. Drawings showing the size and location of the fire suppression access port. 2. Certificate of Compliance | 1. L-7.5 2. L-3.5 | I&A | |
| 3.10. 3. 1. B / 4. 3.10. 3. 1. B | Portable Fire Extinguisher | N/A | I&A | 1. Drawings showing the size and location of the fire suppression access port. 2. Certificate of Compliance | 1. L-7.5 2. L-3.5 | I&A | CIR panel thickness is not greater than 3.175mm. |
| 3.10. 3. 2 / 4. 3.10. 3. 2 | Fire Suppression Access Port Accessibility | A | D | Certificate of Compliance | L-3.5 | D or A | |
| 3.10. 3. 3 / 4. 3.10. 3. 3 | Fire Suppressant Distribution | A | T or A | Certificate of Compliance | L-3.5 | A or T | |
| 3.10. 4. A / | Labeling | A | I | Certificate of | L-3.5 | I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|--|----------------------------|------------------------|--|---------------------------|--|---|
| 4. 3.10. 4. A | | | | Compliance | | | |
| 3.10. 4. B / 4. 3.10. 4. B | Labeling | A | I | Drawing and a COC showing the size and location of the fire detection indicator. | L-7.5 | N/A | |
| 3.11 / 4. 3.11 | MATERIALS AND PARTS INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.11. 1 / 4. 3.11. 1 | Materials and Parts Use and Selection | A | Safety ² | Certificate of Compliance. | L-3.5 | Safety ² | |
| 3.11. 2 / 4. 3.11. 2 | FLUIDS | | TITLE | N/A | N/A | N/A | |
| 3.11. 2. 1. A. / 4. 3.11. 2. 1. A | Fluid Chemical Composition | A | T | Test report including test results. | L-3.5 | T | |
| 3.11. 2. 1. B. / 4. 3.11. 2. 1. B | Fluid Chemical Composition | A | I&T | Certificate of Compliance | L-3.5 | I & T | |
| 3.11. 2. 1. C. / 4. 3.11. 2. 1. C | Fluid Chemical Composition | N/A | I&T | Certificate of Compliance | L-3.5 | I & T | CIR does not utilize the Argon Interface. |
| 3.11. 2. 1. D. / 4. 3.11. 2. 1. D | Fluid Chemical Composition | N/A | I&T | Certificate of Compliance | L-3.5 | I & T | CIR does not utilize the CO ₂ Interface. |
| 3.11. 2. 1. E. / 4. 3.11. 2. 1. E | Fluid Chemical Composition | N/A | I&T | Certificate of Compliance | L-3.5 | I & T | CIR does not utilize the Helium Interface. |
| 3.11. 2. 2. A. / 4. 3.11. 2. 2. A | Fluid System Cleanliness | A | I | Certificate of Compliance | L-3.5 | I | Note: Required data is provided by 3.11.2.1.A. |
| 3.11. 2. 2. B. / 4. 3.11. 2. 2. B | Fluid System Cleanliness | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.11. 2. 2. C. / 4. 3.11. 2. 2. C | Fluid System Cleanliness | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not utilize the Argon Interface. |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|--------------------------------------|---|----------------------------|------------------------|---------------------------|---------------------------|--|---|
| 3.11. 2. 2. D. / 4. 3.11. 2. 2. D | Fluid System Cleanliness | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not utilize the CO ₂ Interface. |
| 3.11. 2. 2. E. / 4. 3.11. 2. 2. E | Fluid System Cleanliness | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not utilize the Helium Interface. |
| 3.11. 2. 3. A. / 4. 3.11. 2. 3. A | Thermal Cooling System Wetted Materials | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.11. 2. 3. B. / 4. 3.11. 2. 3. B | Thermal Cooling System Wetted Materials | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.11. 2. 3. C. / 4. 3.11. 2. 3. C | Thermal Cooling System Wetted Materials | A | A or T | Certificate of Compliance | L-3.5 | A or T | |
| 3.11. 3 / 4. 3.11. 3 | Cleanliness | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.11. 4 / 4. 3.11. 4 | Fungus Resistant Material | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.11. 5/ 4. 3.11. 5 | Pyrotechnics | | NVR | N/A | N/A | N/A | |
| 3.12 / 4. 3.12 | HUMAN FACTORS INTERFACE REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.12. 1. A / 4. 3.12. 1. A | Strength Requirements | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 1. B / 4. 3.12. 1. B | Strength Requirements | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 2 / 4. 3.12. 2 | BODY ENVELOPE AND REACH ACCESSIBILITY | | TITLE | N/A | N/A | N/A | |
| 3.12. 2. 1 / 4. 3.12. 2. 1 | Adequate Clearance | A | A or D | Certificate of Compliance | L-3.5 | A or D | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|----------------------------|------------------------|---------------------------|---------------------------|--|-----------------|
| 3.12. 2. 2. A / 4. 3.12. 2. 2. A | Accessibility | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 2. 2. B / 4. 3.12. 2. 2. B | Accessibility | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 2. 3 / 4. 3.12. 2. 3 | Full Size Range Accommodation | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 3 / 4. 3.12. 3 | HABITABILITY | | TITLE | N/A | N/A | N/A | |
| 3.12. 3. 1 / 4. 3.12. 3. 1 | HOUSEKEEPING | | TITLE | N/A | N/A | N/A | |
| 3.12. 3. 1. 1 / 4. 3.12. 3. 1. 1 | Closures and Covers | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 3. 1. 2. A / 4. 3.12. 3. 1. 2. A | Built-In Control | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 3. 1. 2. B / 4. 3.12. 3. 1. 2. B | Built-In Control | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 3. 1. 3 / 4. 3.12. 3. 1. 3 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 3. 1. 4 / 4. 3.12. 3. 1. 4 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 3. 1. 5 / 4. 3.12. 3. 1. 5 | One-Handed Operation | A | D | Certificate of Compliance | L-3.5 | D | |
| 3.12. 3. 2 / 4. 3.12. 3. 2 | Touch Temperature | | TITLE | N/A | N/A | N/A | |
| 3.12. 3. 2. 1 / 4. 3.12. 3. 2. 1 | Continuous/Incidental Contact - High Temperature | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.12. 3. 2. 2 / 4. 3.12. 3. 2. 2 | Continuous/Incidental Contact - Low Temperature | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.12. 3. 3 / 4. 3.12. 3. 3 | Acoustics Requirement | | NVR | N/A | N/A | N/A | |
| 3.12. 3. 3. 1. A / | Continuous Noise | N/A | T | Acoustics summary that | L-7.5 | N/A | CIR has subrack |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|----------------------------|---------------------------|--|------------------------------------|---|---|
| 4. 3.12. 3. 3. 1. A | Limits - Subracks Not Changed Out | | | includes a list of potential noise sources and their locations. Continuous Noise Source - SPL (dB) for the eight octave bands | | | equipment that will be changed out. |
| 3.12. 3. 3. 1. B / 4. 3.12. 3. 3. 1. B | Continuous Noise Limits - Subracks Changed Out | E | A* | Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source - SPL (dB) for the eight octave bands | L-7.5 | A&T | *Test correlated analytical model or some other method approved and documented in the Acoustic Noise Control Plan.) 57217-NA-0040A |
| 3.12. 3. 3. 1. C / 4. 3.12. 3. 3. 1. C | Continuous Noise Limits - Independently Operated Equipment | N/A | T | Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source - SPL (dB) for the eight octave bands | L-7.5 | N/A | CIR has not independently operated equipment. |
| 3.12. 3. 3. 1. D / 4. 3.12. 3. 3. 1. D | Continuous Noise Limits – Integrated Racks That Have Crew Operations Within the Rack Volume | N/A | T or A* | Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source – SPL (dB) for the eight octave bands | L-7.5 | T or A* | No normal crew operations within the CIR rack volume. Payload operations occur only with CIR rack doors closed *Test correlated analytical model or some other |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|----------------------------|------------------------|--|---------------------------|--|--|
| | | | | | | | method approved and documented in the Acoustic Noise Control Plan.) |
| 3.12. 3. 3. 2. A / 4. 3.12. 3. 3. 2. A | Intermittent Noise Limits – Integrated Racks That Do Not Have Crew Operations Within the Rack Volume | A | T or A* | Acoustics summary that includes a list of potential noise sources and their locations. Intermittent Noise Source - Overall A-weighted SPL (dBA) | L-7.5 | T or A* | *Test correlated analytical model or some other method approved and documented in the Acoustic Noise Control Plan.) |
| 3.12. 3. 3. 2. B / 4. 3.12. 3. 3. 2. B | Intermittent Noise Limits – Integrated Racks That Have Crew Operations Within the Rack Volume | N/A | T or A* | Acoustics summary that includes a list of potential noise sources and their locations. Intermittent Noise Source - Overall A-weighted SPL (dBA) | L-7.5 | T or A* | No normal crew operations within the CIR rack volume. Payload operations occur only with CIR rack doors closed. *Test correlated analytical model or some other method approved and documented in the Acoustic Noise Control Plan.) |
| 3.12. 3. 4. A / 4. 3.12. 3. 4. A | Lighting Design | A | T or I | Certificate of Compliance | L-3.5 | T or I | |
| 3.12. 3. 4. B / 4. 3.12. 3. 4. B | Lighting Design | A | T | Certificate of Compliance | L-3.5 | T | |
| 3.12. 3. 4. C / | Lighting Design | N/A | D | Certificate of | L-3.5 | D | CIR has no light |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|----------------------------|------------------------|---------------------------|---------------------------|--|----------|
| 4. 3.12. 3. 4. C | | | | Compliance | | | source. |
| 3.12. 3. 4. D / 4. 3.12. 3. 4. D | Lighting Design | A | D | Certificate of Compliance | L-3.5 | D | |
| 3.12. 3. 4. E / 4. 3.12. 3. 4. E | Deleted | | N/A | N/A | N/A | N/A | |
| 3.12. 4 / 4. 3.12. 4 | STRUCTURAL/MECH ANICAL INTERFACES | | TITLE | N/A | N/A | N/A | |
| 3.12. 4. 1 / 4. 3.12. 4. 1 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 2 / 4. 3.12. 4. 2 | PAYLOAD HARDWARE MOUNTING | | TITLE | N/A | N/A | N/A | |
| 3.12. 4. 2. 1 / 4. 3.12. 4. 2. 1 | Equipment Mounting | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 4. 2. 2 / 4. 3.12. 4. 2. 2 | Drawers and Hinged Panels | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 2. 3 / 4. 3.12. 4. 2. 3 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 2. 4 / 4. 3.12. 4. 2. 4 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 2. 5 / 4. 3.12. 4. 2. 5 | Alignment | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 2. 6 / 4. 3.12. 4. 2. 6 | Slide-out Stops | A | A or D or I | Certificate of Compliance | L-3.5 | A or D or I | |
| 3.12. 4. 2. 7 / 4. 3.12. 4. 2. 7 | Push-Pull Forces | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 2. 8 / 4. 3.12. 4. 2. 8 | Access | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 4. 2. 8. 1. A / 4. 3.12. 4. 2. 8. 1. A | Covers | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 2. 8. 1. B / 4. 3.12. 4. 2. 8. 1. B | Covers | A | A | Certificate of Compliance | L-3.5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applicability | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|-----------------------------|-----------------------|------------------------|---------------------------|---------------------------|--|------------------------------------|
| 3.12. 4. 2. 8. 2 / 4. 3.12. 4. 2. 8. 2 | Self-Supporting Covers | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 2. 8. 3 / 4. 3.12. 4. 2. 8. 3 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 2. 8. 4 / 4. 3.12. 4. 2. 8. 4 | Unique Tools | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not utilize unique tools. |
| 3.12. 4. 3 / 4. 3.12. 4. 3 | CONNECTORS | | TITLE | N/A | N/A | N/A | |
| 3.12. 4. 3. 1 / 4. 3.12. 4. 3. 1 | One-Handed Operation | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 4. 3. 2. A1 / 4. 3.12. 4. 3. 2. A1 | Accessibility | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 4. 3. 2. A2 / 4. 3.12. 4. 3. 2. A2 | Accessibility | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 4. 3. 2. B / 4. 3.12. 4. 3. 2. B | Accessibility | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 3. 3. A / 4. 3.12. 4. 3. 3. A | Ease of Disconnect | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 3. 3. B / 4. 3.12. 4. 3. 3. B | Ease of Disconnect | E | A | Certificate of Compliance | L-3.5 | A | 57217-NA-0006A |
| 3.12. 4. 3. 4 / 4. 3.12. 4. 3. 4 | Indication of Pressure/Flow | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 3. 5 / 4. 3.12. 4. 3. 5 | Self Locking | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 3. 6. A / 4. 3.12. 4. 3. 6. A | Connector Arrangement | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 3. 6. B / 4. 3.12. 4. 3. 6. B | Connector Arrangement | E | I | Certificate of Compliance | L-3.5 | I | 57217-NA-0007A |
| 3.12. 4. 3. 7 / 4. 3.12. 4. 3. 7 | Arc Containment | A | Safety ^{2A} | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.12. 4. 3. 8 / 4. 3.12. 4. 3. 8 | Connector Protection | A | A | Certificate of Compliance | L-3.5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|--|-------------------------------|---------------------------|------------------------------|------------------------------------|---|----------|
| 3.12. 4. 3. 9 / 4. 3.12. 4. 3. 9 | Connector Shape | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 3.10 / 4. 3.12. 4. 3.10 | Fluid and Gas Line Connectors | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 3.11 / 4. 3.12. 4. 3.11 | Alignment Marks or Guide Pins | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 3.12. A / 4. 3.12. 4. 3.12. A | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 3.12. B / 4. 3.12. 4. 3.12. B | DELETED | N/A | N/A | N/A | N/A | N/A | |
| 3.12. 4. 3.13 / 4. 3.12. 4. 3.13 | Pin Identification | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 3.14 / 4. 3.12. 4. 3.14 | Orientation | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 4. 3.15. A / 4. 3.12. 4. 3.15. A | Hose/Cable Restraints | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 3.15. B / 4. 3.12. 4. 3.15. B | Hose/Cable Restraints | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 3.15. C / 4. 3.12. 4. 3.15. C | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 3.15. D / 4. 3.12. 4. 3.15. D | Hose/Cable Restraints | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4 / 4. 3.12. 4. 4 | FASTENERS | | TITLE | N/A | N/A | N/A | |
| 3.12. 4. 4. 1 / 4. 3.12. 4. 4. 1 | Non-Threaded Fastener Status Indication | A | I or D | Certificate of Compliance | L-3.5 | D or I | |
| 3.12. 4. 4. 2 / 4. 3.12. 4. 4. 2 | Mounting Bolt/Fastener Spacing | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 3 / 4. 3.12. 4. 4. 3 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 4. 4 / 4. 3.12. 4. 4. 4 | Multiple Fasteners | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 5 / | Captive Fasteners | A | A | Certificate of | L-3.5 | A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|-------------------------------|---------------------------|------------------------------|------------------------------------|---|----------|
| 4. 3.12. 4. 4. 5 | | | | Compliance | | | |
| 3.12. 4. 4. 6. A / 4. 3.12. 4. 4. 6. A | Quick Release Fasteners | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 6. B / 4. 3.12. 4. 4. 6. B | Quick Release Fasteners | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 7 / 4. 3.12. 4. 4. 7 | Threaded Fasteners | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 8. A / 4. 3.12. 4. 4. 8. A | Over Center Latches - Nonselatching | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 8. B / 4. 3.12. 4. 4. 8. B | Over Center Latches - Latch Lock | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 8. C / 4. 3.12. 4. 4. 8. C | Over Center Latches - Latch Handles | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4. 9 / 4. 3.12. 4. 4. 9 | Winghead Fasteners | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4.10 / 4. 3.12. 4. 4.10 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 4.11. A / 4. 3.12. 4. 4.11. A | Fastener Head Type | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4.11. B / 4. 3.12. 4. 4.11. B | Fastener Head Type | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4.11. C / 4. 3.12. 4. 4.11. C | Fastener Head Type | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 4. 4.12 / 4. 3.12. 4. 4.12 | One-Handed Actuation | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 4. 4.13 / 4. 3.12. 4. 4.13 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 4. 4.14 / 4. 3.12. 4. 4.14 | Access Holes | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5 / 4. 3.12. 5 | CONTROLS AND DISPLAYS | | TITLE | N/A | N/A | N/A | |
| 3.12. 5. 1 / 4. 3.12. 5. 1 | Controls Spacing Design Requirements | A | I | Certificate of Compliance | L-3.5 | I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------------|---|-------------------------------|---------------------------|------------------------------|------------------------------------|---|----------|
| 3.12. 5. 2 / 4. 3.12. 5. 2 | ACCIDENTAL ACTUATION | | TITLE | N/A | N/A | N/A | |
| 3.12. 5. 2. 1 / 4. 3.12. 5. 2. 1 | Protective Methods | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 2. 2 / 4. 3.12. 5. 2. 2 | Noninterference | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 2. 3 / 4. 3.12. 5. 2. 3 | Dead-Man Controls | | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.12. 5. 2. 4 / 4. 3.12. 5. 2. 4 | Barrier Guards | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 2. 5 / 4. 3.12. 5. 2. 5 | Recessed Switch Protection | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 2. 6 / 4. 3.12. 5. 2. 6 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 5. 2. 7 / 4. 3.12. 5. 2. 7 | Position Indication | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 2. 8 / 4. 3.12. 5. 2. 8 | Hidden Controls | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 2. 9 / 4. 3.12. 5. 2. 9 | Hand Controllers | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 3. A / 4. 3.12. 5. 3. A | Valve Controls - Low Torque Valves | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 3. B / 4. 3.12. 5. 3. B | Valve Controls - Intermediate Torque Valves | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 3. C / 4. 3.12. 5. 3. C | Valve Controls - High Torque Valves | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 3. D / 4. 3.12. 5. 3. D | Valve Controls - Handle Dimensions | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 3. E / 4. 3.12. 5. 3. E | Valve Controls - Rotary Valve Controls | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 5. 4 / 4. 3.12. 5. 4 | Toggle Switches | A | I | Certificate of Compliance | L-3.5 | I | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---|----------------------------|------------------------|---------------------------|---------------------------|--|-----------------------------------|
| 3.12. 6 / 4. 3.12. 6 | Restraints and Mobility Aids | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 6. 1. A / 4. 3.12. 6. 1. A | Stowage Drawer Contents Restraints | N/A | I&A | Certificate of Compliance | L-3.5 | I&A | CIR does not have stowage drawer. |
| 3.12. 6. 1. B / 4. 3.12. 6. 1. B | Stowage Drawer Contents Restraints | N/A | D | Certificate of Compliance | L-3.5 | D | CIR does not have stowage drawer. |
| 3.12. 6. 1. C / 4. 3.12. 6. 1. C | Stowage Drawer Contents Restraints | N/A | D | Certificate of Compliance | L-3.5 | D | CIR does not have stowage drawer. |
| 3.12. 6. 2. A / 4. 3.12. 6. 2. A | Stowage and Equipment Drawers/Trays | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not have stowage drawer. |
| 3.12. 6. 2. B / 4. 3.12. 6. 2. B | Stowage and Equipment Drawers/Trays | N/A | I | Certificate of Compliance | L-3.5 | I | CIR does not have stowage drawer. |
| 3.12. 6. 3 / 4. 3.12. 6. 3 | Captive Parts | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 6. 4 / 4. 3.12. 6. 4 | HANDLE AND GRASP AREA DESIGN REQUIREMENTS | | TITLE | N/A | N/A | N/A | |
| 3.12. 6. 4. 1 / 4. 3.12. 6. 4. 1 | Handles and Restraints | A | I or D | Certificate of Compliance | L-3.5 | D or I | |
| 3.12. 6. 4. 2 / 4. 3.12. 6. 4. 2 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 6. 4. 3 / 4. 3.12. 6. 4. 3 | Handle Location/Front Access | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 6. 4. 4 / 4. 3.12. 6. 4. 4 | Handle Dimensions | A | A or D | Certificate of Compliance | L-3.5 | A or D | |
| 3.12. 6. 4. 5. A / 4. 3.12. 6. 4. 5. A | Non-Fixed Handles Design Requirements | A | A&D | Certificate of Compliance | L-3.5 | A&D | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|---------------------------------------|----------------------------|------------------------|--|---------------------------|--|----------|
| 3.12. 6. 4. 5. B / 4. 3.12. 6. 4. 5. B | Non-Fixed Handles Design Requirements | A | D | Certificate of Compliance | L-3.5 | D | |
| 3.12. 6. 4. 5. C / 4. 3.12. 6. 4. 5. C | Non-Fixed Handles Design Requirements | A | I&D | Certificate of Compliance | L-3.5 | D&I | |
| 3.12. 7 / 4. 3.12. 7 | Identification Labeling | A | I | Certificate of Compliance showing Form 732 approval. | L-3.5 | I | |
| 3.12. 8 / 4. 3.12. 8 | Color | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 9 / 4. 3.12. 9 | Crew Safety | | TITLE | N/A | N/A | N/A | |
| 3.12. 9. 1 / 4. 3.12. 9. 1 | Electrical Hazards | | N/A | N/A | N/A | N/A | |
| 3.12. 9. 1. 1 / 4. 3.12. 9. 1. 1 | Mismatched | A | A&I&D | Certificate of Compliance | L-3.5 | A&D&I | |
| 3.12. 9. 1. 2 / 4. 3.12. 9. 1. 2 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 9. 1. 3 / 4. 3.12. 9. 1. 3 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 9. 1. 4 / 4. 3.12. 9. 1. 4 | Overload Protection | | NVR | N/A | N/A | N/A | |
| 3.12. 9. 1. 4. 1 / 4. 3.12. 9. 1. 4. 1 | Device Accessibility | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 9. 1. 4. 2 / 4. 3.12. 9. 1. 4. 2 | Extractor-Type Fuse Holder | A | D | Certificate of Compliance | L-3.5 | D | |
| 3.12. 9. 1. 4. 3 / 4. 3.12. 9. 1. 4. 3 | Overload Protection Location | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 9. 1. 4. 4 / 4. 3.12. 9. 1. 4. 4 | Overload Protection Identification | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 9. 1. 4. 5 / 4. 3.12. 9. 1. 4. 5 | Automatic Restart Protection | A | D | Certificate of Compliance | L-3.5 | D | |
| 3.12. 9. 1. 5 / 4. 3.12. 9. 1. 5 | DELETED | | N/A | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|---|-------------------------------------|----------------------------|------------------------|---------------------------|---------------------------|--|-------------------------------------|
| 3.12. 9. 1. 5. 1 / 4. 3.12. 9. 1. 5. 1 | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 9. 2 / 4. 3.12. 9. 2 | Sharp Edges and Corners Protection | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.12. 9. 3 / 4. 3.12. 9. 3 | Holes | A | A&I | Certificate of Compliance | L-3.5 | A&I | |
| 3.12. 9. 4 / 4. 3.12. 9. 4 | Latches | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 9. 5 / 4. 3.12. 9. 5 | Screws and Bolts | A | A&I | Certificate of Compliance | L-3.5 | A&I | |
| 3.12. 9. 6 / 4. 3.12. 9. 6 | Securing Pins | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 9. 7 / 4. 3.12. 9. 7 | Levers, Cranks, Hooks, and Controls | A | A&I | Certificate of Compliance | L-3.5 | A&I | |
| 3.12. 9. 8 / 4. 3.12. 9. 8 | Burrs | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 9. 9. A / 4. 3.12. 9. 9. A | Locking Wires | A | A | Certificate of Compliance | L-3.5 | A | |
| 3.12. 9. 9. B / 4. 3.12. 9. 9. B | Locking Wires | A | I | Certificate of Compliance | L-3.5 | I | |
| 3.12. 9.10. A / 4. 3.12. 9.10. A | Audio Device Displays | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not utilize audio devices. |
| 3.12. 9.10. B / 4. 3.12. 9.10. B | DELETED | | N/A | N/A | N/A | N/A | |
| 3.12. 9.10. C / 4. 3.12. 9.10. C | Audio Device Displays | N/A | D | Certificate of Compliance | L-3.5 | D | CIR does not utilize audio devices. |
| 3.12. 9.10. D / 4. 3.12. 9.10. D | Audio Device Displays | N/A | A | Certificate of Compliance | L-3.5 | A | CIR does not utilize audio devices. |
| 3.12. 9.11 / 4. 3.12. 9.11 | DELETED | | N/A | N/A | N/A | N/A | |

TABLE 4.2-1 APPLICABILITY/VERIFICATION MATRIX (63 PAGES)

| IRD Paragraph | IRD Requirement | Payload Applica- bility | Verification Method(s) | Required Submittal Data | Submittal Date (L-X mos.) | Subrack PL Changeout Verification Method | Comments |
|-------------------------------|--------------------------------------|----------------------------|---------------------------|------------------------------|------------------------------------|---|----------|
| 3.12. 9.12 / 4. 3.12. 9.12 | Egress | A | Safety ² | Certificate of Compliance | L-3.5 | Safety ² | |
| 3.12. 9.13 / 4. 3.12. 9.13 | Lasers | | NVR | N/A | N/A | N/A | |
| 3.12. 9.14 / 4. 3.12. 9.14 | Optical Equipment and Instruments | | NVR | N/A | N/A | N/A | |
| 3.12.10 / 4. 3.12.10 | Payload In-Flight Maintenance | A | A | Certificate of Compliance | L-3.5 | A | |

Note 1: Integrated racks with on-orbit configuration changes will require re-verification by the rack integrator for MPLM descent.

Note 2: Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report to the PSRP.

Note 3: The requirements that comprise this applicability matrix are based on Revision F of SSP 57001 and Revision H of SSP 57000.

TABLE 4.2-2 CIR PRE-LAUNCHED HARDWARE IDENTIFICATION (7 PAGES)

| CIR Harnesses | | | | | | | | |
|-----------------------------|--|----------------|---------------|--|------------------|--|-------------------------------|---------------------------------------|
| Hard-ware Group-ing | MANIFEST (PROPOSED) | P/N | S/N | Hardware Item(s) | Mass (kg) | Volume Ft³ (m³) | Nominal Ops Stow Item? | Comments |
| 1 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH61002 | 2002 | CIR EPCU Power Cable #2 | 2.35 | 0.000 | N | |
| 1 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH61006 | 2002 | CIR IPSU Power/Data Cable | 0.95 | 0.003 | N | launched attached to CIR IPSU Adapter |
| 1 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH61006 | 2003 | CIR IPSU Power/Data Cable | 2.09 (0.95) | 0.11 (0.003) | N | launched attached to CIR IPSU Adapter |
| 1 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH61001 | TBD | CIR EPCU To Optics Bench Power Harness | 5.69 (2.58) | 0.25 (0.007) | N | |
| 1 | 1J & Subsequent | 67212MFAN14000 | 2001 | CIR LLL-UV Imaging Package | 20.48 (9.29) | 1.41 (0.04) | N | |
| CIR PaRIS Umbilicals | | | | | | | | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1F15191-1 | SEE PARIS ADP | Umbilical Assy, J1 Main Power | 1.99 | 0.001 | N | November 2010 |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1F15192-1 | SEE PARIS ADP | Umbilical Assy, J2 Aux Power | 1.99 | 0.001 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1F15193-1 | SEE PARIS ADP | Umbilical Assy, GN2 | 1.50 | 0.008 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61587-13 | SEE PARIS ADP | Umbilical Assembly, 1553A | 0.54 | 0.005 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61587-14 | SEE PARIS ADP | Umbilical Assembly, 1553B | 0.49 | 0.005 | N | |

TABLE 4.2-2 CIR PRE-LAUNCHED HARDWARE IDENTIFICATION (7 PAGES)

| CIR PaRIS Umbilicals | | | | | | | | |
|--------------------------------------|--|----------------|---------------|--------------------------------|-----------|--|------------------------|---------------|
| Hardware Grouping | MANIFEST (PROPOSED) | P/N | S/N | Hardware Item(s) | Mass (kg) | Volume Ft ³ (m ³) | Nominal Ops Stow Item? | Comments |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61587-15 | SEE PARIS ADP | Umbilical Assembly, HDRL | 0.41 | 0.004 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61587-16 | SEE PARIS ADP | Umbilical Assembly, Opt. Video | 0.53 | 0.004 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61587-17 | SEE PARIS ADP | Umbilical Assembly, FDS/Maint. | 0.53 | 0.005 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61587-18 | SEE PARIS ADP | Umbilical Assembly, LAN-1 | 0.42 | 0.004 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61587-19 | SEE PARIS ADP | Umbilical Assembly, LAN-2 | 0.43 | 0.004 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61634-2 | SEE PARIS ADP | Umbilical Assembly, Waste Gas | 1.50 | 0.010 | N | |
| 2 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61685-16 | SEE PARIS ADP | RF Ground Strap (PaRIS) | 0.199 | 0.003 | N | |
| CIR Harnesses– structural components | | | | | | | | |
| 3 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAB30200 | 2002 | CIR IPSU Adapter | 3.58 | 0.010 | N | November 2010 |
| 3 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAB30200 | 2003 | CIR IPSU Adapter | 3.58 | 0.010 | N | |

TABLE 4.2-2 CIR PRE-LAUNCHED HARDWARE IDENTIFICATION (7 PAGES)

| CIR PaRIS Mechanical components | | | | | | | | |
|---------------------------------|--|-------------|------------------|--|--------------|--|---------------------------------|---------------|
| Hard- ware Group- ing | MANIFEST (PROPOSED) | P/N | S/N | Hardware Item(s) | Mass (kg) | Volume Ft ³ (m ³) | Nominal Ops Stow Item? | Comments |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00095-2 | SEE PARIS ADP | Insert Assembly - Snubber Cup (Top Right) | 0.12 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00095-1 | SEE PARIS ADP | Insert Assembly - Snubber Cup (Top Left) | 0.12 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00095-502 | SEE PARIS ADP | Insert Assembly - Snubber Cup (Lower Right) | 0.12 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00095-501 | SEE PARIS ADP | Insert Assembly - Snubber Cup (Lower Left) | 0.12 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00905-1 | SEE PARIS ADP | LOWER LEFT SNUBBER PIN MECHANISM ASSY. | 1.59 | 0.004 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00905-501 | SEE PARIS ADP | LOWER RIGHT SNUBBER PIN MECHANISM ASSY. | 1.59 | 0.004 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00908-1 | SEE PARIS ADP | Bracket Assembly, Butterfly | 0.20 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00950-1 | SEE PARIS ADP | Isolator Assembly, Z-Axis | 1.30 | 0.001 | N | November 2010 |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00950-1 | SEE PARIS ADP | Isolator Assembly, Z-Axis | 1.30 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00951-1 | SEE PARIS ADP | Isolator Assembly, Y-Axis | 1.30 | 0.001 | N | |

TABLE 4.2-2 CIR PRE-LAUNCHED HARDWARE IDENTIFICATION (7 PAGES)

| CIR PaRIS Mechanical components | | | | | | | | |
|---------------------------------|--|--------------|---------------|---------------------------|-----------|--|------------------------|----------|
| Hard-ware Grouping | MANIFEST (PROPOSED) | P/N | S/N | Hardware Item(s) | Mass (kg) | Volume Ft ³ (m ³) | Nominal Ops Stow Item? | Comments |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00951-1 | SEE PARIS ADP | Isolator Assembly, Y-Axis | 1.30 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00952-1 | SEE PARIS ADP | Isolator Assembly, X-Axis | 1.30 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00952-1 | SEE PARIS ADP | Isolator Assembly, X-Axis | 1.30 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00953-1 | SEE PARIS ADP | Isolator Assembly, Upper | 1.30 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 1J00953-1 | SEE PARIS ADP | Isolator Assembly, Upper | 1.30 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61571-30 | SEE PARIS ADP | Pin, Center | 1.00 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61571-30 | SEE PARIS ADP | Pin, Center | 1.00 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61571-35 | SEE PARIS ADP | BRIDGE BRACKET | 0.45 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61571-36 | SEE PARIS ADP | BRIDGE BRACKET | 0.45 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61571-37 | SEE PARIS ADP | BRIDGE BRACKET FT | 0.45 | 0.000 | N | |

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TABLE 4.2-2 CIR PRE-LAUNCHED HARDWARE IDENTIFICATION (7 PAGES)

| CIR PaRIS Mechanical components | | | | | | | | |
|--|--|----------------|---------------|---|------------------|--|-------------------------------|-----------------|
| Hard-ware Group-ing | MANIFEST (PROPOSED) | P/N | S/N | Hardware Item(s) | Mass (kg) | Volume Ft³ (m³) | Nominal Ops Stow Item? | Comments |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61571-38 | SEE PARIS ADP | BRIDGE BRACKET FT | 0.45 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61615-12 | SEE PARIS ADP | Pushrod FTG Assembly | 0.40 | 0.000 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61664-13 | SEE PARIS ADP | UPPER LEFT SNUBBER PIN MECHANISM ASSY. | 3.00 | 0.004 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61664-14 | SEE PARIS ADP | UPPER RIGHT SNUBBER PIN MECHANISM ASSY | 3.00 | 0.004 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61664-17 | SEE PARIS ADP | UPPER LEFT SNUBBER CUP MECHANISM ASSY. | 0.90 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61664-18 | SEE PARIS ADP | UPPER RIGHT SNUBBER CUP MECHANISM ASSY | 0.90 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61664-21 | SEE PARIS ADP | LOWER LEFT SNUBBER CUP MECHANISM ASSY. | 2.90 | 0.001 | N | |
| 4 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 683-61664-22 | SEE PARIS ADP | LOWER RIGHT SNUBBER CUP MECHANISM ASSY. | 2.90 | 0.001 | N | |
| CIR Rack Outfitting | | | | | | | | |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAD30005 | 2001 | CIR GN2 Hose | 1.90 (0.86) | 0.14 (0.004) | N | |

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TABLE 4.2-2 CIR PRE-LAUNCHED HARDWARE IDENTIFICATION (7 PAGES)

| CIR Rack Outfitting | | | | | | | | |
|---------------------|--|----------------|------|----------------------------|-------------|--|------------------------|-------------------------|
| Hardware Grouping | MANIFEST (PROPOSED) | P/N | S/N | Hardware Item(s) | Mass (kg) | Volume Ft ³ (m ³) | Nominal Ops Stow Item? | Comments |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAD30007 | 2001 | CIR VES HOSE | 2.20 (1.00) | 0.21 (0.006) | N | |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212MFAH20721 | 2001 | CIR I/O Processor Air Duct | 0.72 | 0.002 | N | |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH20812 | 2002 | CIR IAM F/O Cable #1 | 0.04 | 0.001 | N | |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH20812 | 2003 | CIR IAM F/O Cable #1 | 0.04 | 0.001 | N | |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH20812 | 2004 | CIR IAM F/O Cable #1 | 0.04 | 0.001 | Y | On-orbit Spare - Stowed |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67212EFAH20812 | 2005 | CIR IAM F/O Cable #1 | 0.04 | 0.001 | Y | On-orbit Spare - Stowed |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67213MFAF15050 | 2001 | FCF Shared Handle | 0.17 | 0.000 | Y | Stowed Item |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAB60510 | 2001 | FCF EPCU T-Handle | 0.20 | 0.000 | Y | Stowed Maintenance Item |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAB60510 | 2002 | FCF EPCU T-Handle | 0.20 | 0.000 | Y | Stowed Maintenance Item |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAD11070 | 2001 | FCF ATCU Vacuum Attachment | 0.19 | 0.001 | Y | Stowed Maintenance Item |

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TABLE 4.2-2 CIR PRE-LAUNCHED HARDWARE IDENTIFICATION (7 PAGES)

| CIR Rack Outfitting | | | | | | | | |
|----------------------------|--|----------------|------------|-------------------------|------------------|--|-------------------------------|-----------------|
| Hard-ware Group-ing | MANIFEST (PROPOSED) | P/N | S/N | Hardware Item(s) | Mass (kg) | Volume Ft³ (m³) | Nominal Ops Stow Item? | Comments |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAD11009 | 2004 | CIR Fan Lint Screen | 1.04 (0.47) | 0.28 (0.008) | Y | Stowed Spare |
| 5 | 13A.1 (SpaceHAB), 26P & Subsequent Russian Flights | 67211MFAD11009 | 2005 | CIR Fan Lint Screen | 1.04 (0.47) | 0.28 (0.008) | Y | Stowed Spare |
| 5 | 1J & Subsequent | 67211MFAB21000 | 2001 | FCF UML Latch Handle | 5.09 (2.31) | 0.01 (0.0003) | N | |
| 5 | 1J & Subsequent | 67212MFAH33013 | N/A | CIR Window Coated | 19.60 (8.89) | 0.04 (0.001) | N | |
| 5 | 1J & Subsequent | 67212MFAH33000 | N/A | CIR Window Uncoated | 2.80 (1.27) | 0.04 (0.001) | N | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|------------------------------|---|---|---|---|---|---|-----------------------------|----------------------------|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3.0 / 4.3.0 | PAYLOAD INTERFACE REQUIREMENTS AND GUIDANCE | | | | | | TITLE | N/A | |
| 3.1 / 4.3.1 | STRUCTURAL/ MECHANICAL, MICROGRAVITY, AND STOWAGE INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3.1.1 / 4.3.1.1 | STRUCTURAL/ MECHANICAL | | | | | | TITLE | N/A | |
| 3.1.1.1. A - D | GSE Interfaces | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No interface to GSE |
| 3.1.1.2. A / 4.3.1.1.2. A | MPLM Interfaces | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | Hardware does not interface with the MPLM structural attach points. |
| 3.1.1.2. B / 4.3.1.1.2. B | MPLM Interfaces | N/A | A* | N/A | A* | N/A | A | Certificate of Compliance. | 1, 3, and 5 have no sealed volumes. *Requirement is applicable only if hardware is launched in the MPLM. |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 1. 1. 2. E / 4. 3. 1. 1. 2. E | MPLM Interfaces | N/A | N/A | N/A | N/A | N/A | A | 1. Data Cert, based on static analysis using approved FEM (or DCL analysis results), providing the MPLM interface attach point forces and margins of safety calculations based on the allowable limits as specified in SSP 41017 Part 1, par. 3.2.1.4.3. 2. Data Cert providing the MPLM interface attach point forces and margins of safety calculations based on the allowable limits as specified in SSP 41017 Part 1, par. 3.2.1.4.3. | Hardware does not interface with the MPLM structural attach points. |
| 3. 1. 1. 2. 1 / 4. 3. 1. 1. 2. 1 | MPLM Late/Early Access Requirements | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No Late/Early access requirements |
| 3. 1. 1. 2. 1. 1. A / 4. 3. 1. 1. 2. 1. 1. A | MPLM Late Access Envelope (KSC) | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No Late/Early access requirements |
| 3. 1. 1. 2. 1. 1. B / 4. 3. 1. 1. 2. 1. 1. B | MPLM Late Access Envelope (KSC) | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No Late/Early access requirements |
| 3. 1. 1. 2. 1. 1. C / 4. 3. 1. 1. 2. 1. 1. C | MPLM Late Access Envelope (KSC) | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No Late/Early access requirements |
| 3. 1. 1. 2. 1. 2. A / 4. 3. 1. 1. 2. 1. 2. A | MPLM Early Access Envelopes (KSC and DFRC) | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No Late/Early access requirements |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|---|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 1. 1. 2. 1. 2. B / 4. 3. 1. 1. 2. 1. 2. B | MPLM Early Access Envelopes (KSC and DFRC) | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No Late/Early access requirements |
| 3. 1. 1. 3. A / 4. 3. 1. 1. 3. A | Loads Requirements | A* | A* | A* | A* | A* | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | *Requirement is applicable only if hardware is launched in the MPLM. |
| 3. 1. 1. 3. B / 4. 3. 1. 1. 3. B | Loads Requirements | N/A | N/A | A | A | N/A | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | Hardware groupings 1, 2, and 5 are not hard mounted to the rack. |
| 3. 1. 1. 3. C / 4. 3. 1. 1. 3. C | Loads Requirements | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | Umbilicals are launched soft stowed and are not launched as part of the rack. |
| 3. 1. 1. 3. D / 4. 3. 1. 1. 3. D | Loads Requirements | N/A | A | A | A | A | A | Data Cert providing a summary listing as defined in SSP 57000, Table 3.1.1.3-1 showing positive margins of safety | Hardware Grouping 1 is not exposed to crew induced loads. |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|--------------------|---|---|---|---|---|-----------------------------|---|--|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 1. 1. 3. E / 4. 3. 1. 1. 3. E | Loads Requirements | A* | A* | A* | A* | A* | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | *Requirement is applicable only if hardware is launched in the MPLM. |
| 3. 1. 1. 3. F / 4. 3. 1. 1. 3. F | Loads Requirements | A* | A* | A* | A* | A* | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | *Requirement is applicable only if hardware is launched in the MPLM. |
| 3. 1. 1. 4. A / 4. 3. 1. 1. 4. A | Rack Requirements | A | A | A | A | A | D&A | Data Cert providing weight and cg summaries for launch and landing of the integrated rack. | |
| 3. 1. 1. 4. B / 4. 3. 1. 1. 4. B | Rack Requirements | N/A | A | N/A | A | N/A | A | Certificate of Compliance. | 1, 3, and 5 have no sealed volumes |
| 3. 1. 1. 4. C / 4. 3. 1. 1. 4. C | Rack Requirements | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance | No attachment to the kneebrace |
| 3. 1. 1. 4. E / 4. 3. 1. 1. 4. E | Rack Requirements | A | A | A | A | A | I | Certificate of Compliance. | |
| 3. 1. 1. 4. I / 4. 3. 1. 1. 4. I | Rack Requirements | N/A | A | N/A | A | A | A | Certificate of Compliance. | 1 and 3 do not affect rotation |
| 3. 1. 1. 4. K / 4. 3. 1. 1. 4. K | Rack Requirements | N/A | N/A | A | N/A | A | A | Certificate of Compliance. | 3 and 5 are the only mounted hardware |
| 3. 1. 1. 4. L / 4. 3. 1. 1. 4. L | Rack Requirements | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No crew restraints |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|---|---|---|---|---|---|-----------------------------|---|--|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 1. 1. 4. M / 4. 3. 1. 1. 4. M | Rack Requirements | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No pressure relief valve |
| 3. 1. 1. 4. N / 4. 3. 1. 1. 4. N | Rack Requirements | A | A | A | A | A | A | Certificate of Compliance | |
| 3. 1. 1. 4. O / 4. 3. 1. 1. 4. O | Rack Requirements | A | A | A | A | A | A | Certificate of Compliance | |
| 3. 1. 1. 4. R / 4. 3. 1. 1. 4. R | Rack Requirements | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Hardware will not interfere or affect seat track installation. |
| 3. 1. 1. 5 / 4. 3. 1. 1. 5 | Safety Critical Structures Requirements | N/A | N/A | A | A | N/A | Per SSP 520051 | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1, 2, and 5 are not safety critical structures |
| 3. 1. 1. 6 / 4. 3. 1. 1. 6 | CONNECTOR AND UMBILICAL PHYSICAL MATE | | | | | | TITLE | N/A | |
| 3. 1. 1. 6. 1 / 4. 3. 1. 1. 6. 1 | Connector Physical Mate | N/A | A | N/A | N/A | A | D | Certificate of Compliance. | 1, 3, and 4 do not interface with UIP, UOP, or fluid service connectors. |
| 3. 1. 1. 6. 2 / 4. 3. 1. 1. 6. 2 | Umbilical Physical Mate | N/A | A | N/A | N/A | A | D | Certificate of Compliance. | 1, 3, and 4 do not interface with the RUP |
| 3. 1. 1. 7. A / 4. 3. 1. 1. 7. A | On-Orbit Payload Protrusions | A | A | A | A | A | I | Data Cert providing drawings identifying all protrusions. | Verified as part of integrated CIR Rack data package |
| 3. 1. 1. 7. B / 4. 3. 1. 1. 7. B | On-Orbit Payload Protrusions | A | A | A | A | A | A | Certificate of Compliance | Verified as part of integrated CIR Rack data package |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|---|---|---|---|---|---|-----------------------------|---|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 1. 1. 7. 1 / 4. 3. 1. 1. 7. 1 | On-Orbit Permanent Protrusions | A | A | A | A | A | I | Data Cert providing drawings identifying all protrusions. | Verified as part of integrated CIR Rack data package |
| 3. 1. 1. 7. 2. A / 4. 3. 1. 1. 7. 2. A | On-Orbit Semi-Permanent Protrusions | A | A | A | A | A | I | Data Cert providing drawings identifying all protrusions. | Verified as part of integrated CIR Rack data package |
| 3. 1. 1. 7. 2. B / 4. 3. 1. 1. 7. 2. B | On-Orbit Semi-Permanent Protrusions | A | A | A | A | A | I | Data Cert providing drawings identifying all protrusions. | Verified as part of integrated CIR Rack data package |
| 3. 1. 1. 7. 2. C / 4. 3. 1. 1. 7. 2. C | On-Orbit Semi-Permanent Protrusions | A | A | A | A | A | D | Certificate of Compliance | Verified as part of integrated CIR Rack data package |
| 3. 1. 1. 7. 3. A / 4. 3. 1. 1. 7. 3. A | On-Orbit Temporary Protrusions | A | A | A | A | A | I | Data Cert providing drawings identifying all protrusions. | Integrated Rack has taken exception to this requirement Verified as part of integrated CIR Rack data package |
| 3. 1. 1. 7. 3. B / 4. 3. 1. 1. 7. 3. B | On-Orbit Temporary Protrusions | A | A | A | A | A | D | Certificate of Compliance | Verified as part of integrated CIR Rack data package |
| 3. 1. 1. 7. 4 / 4. 3. 1. 1. 7. 4 | On-Orbit Momentary Protrusions | A | A | A | A | A | D | Certificate of Compliance | Verified as part of integrated CIR Rack data package |
| 3. 1. 2. 1 / 4. 3. 1. 2. 1 | Quasi-Steady Requirements | N/A | N/A | N/A | N/A | N/A | A | Analysis Report | No source of microgravity disturbance |
| 3. 1. 2. 2 / 4. 3. 1. 2. 2 | Vibratory Requirements/ Mechanical Vibration | N/A | N/A | N/A | N/A | N/A | A | Analysis or Test Report | No source of microgravity disturbance |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|--|---|---|---|---|---|-----------------------------|----------------------------|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 1. 2. 3. A / 4. 3. 1. 2. 3. A | Transient Requirements | N/A | N/A | N/A | N/A | N/A | A | Analysis or Test Report | No source of microgravity disturbance |
| 3. 1. 2. 3. B / 4. 3. 1. 2. 3. B | Transient Requirements | N/A | N/A | N/A | N/A | N/A | A | Analysis or Test Report | No source of microgravity disturbance |
| 3. 1. 2. 6. 1 / 4. 3. 1. 2. 6. 1 | Limit Disturbance Induced ISS Attitude Rate | N/A | N/A | N/A | N/A | N/A | A | Analysis Report | No source of microgravity disturbance |
| 3. 1. 2. 6. 2 / 4. 3. 1. 2. 6. 2 | Limit Disturbance Induced CMG Momentum Usage | N/A | N/A | N/A | N/A | N/A | A | Analysis Report | No source of microgravity disturbance |
| 3. 2 / 4. 3. 2 | ELECTRICAL INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 2. 1. 1 / 4. 3. 2. 1. 1 | STEADY-STATE VOLTAGE CHARACTERIS-TICS | | | | | | TITLE | N/A | |
| 3. 2. 1. 1. 1 / 4. 3. 2. 1. 1. 1 | Interface B | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 1. 2 / 4. 3. 2. 1. 2 | RIPPLE VOLTAGE CHARACTERIS-TICS | | | | | | TITLE | N/A | |
| 3. 2. 1. 2. 1 / 4. 3. 2. 1. 2. 1 | Ripple Voltage and Noise | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 1. 2. 2 / 4. 3. 2. 1. 2. 2 | Ripple Voltage Spectrum | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 1. 3 / 4. 3. 2. 1. 3 | TRANSIENT VOLTAGES | | | | | | TITLE | N/A | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|---|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 2. 1. 3. 1 / 4. 3. 2. 1. 3. 1 | Interface B | A | A | N/A | N/A | N/A | T | Certificate of Compliance. | 1 & 2 Are the only hardware groupings with Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 1. 3. 3 / 4. 3. 2. 1. 3. 3 | Fault Clearing and Protection | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 1. 3. 4. A / 4. 3. 2. 1. 3. 4. A | Non-Normal Voltage Range | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 1. 3. 4. B / 4. 3. 2. 1. 3. 4. B | Non-Normal Voltage Range | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2 / 4. 3. 2. 2 | ELECTRICAL POWER INTERFACE | | | | | | TITLE | N/A | |
| 3. 2. 2. 2. A / 4. 3. 2. 2. 2. A | Power Bus Isolation | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 2. B / 4. 3. 2. 2. 2. B | Power Bus Isolation | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 3 / 4. 3. 2. 2. 3 | Compatibility With Soft Start/Stop RPC | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 4 / 4. 3. 2. 2. 4 | Surge Current | A | A | N/A | N/A | N/A | T&A | 1. Analysis report including surge current profiles for common integrated rack configurations. 2. Test report. | 1 & 2 Are the only hardware groupings with Electrical Power Consuming Equipment (EPCE). |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 2. 2. 5. 1 / 4. 3. 2. 2. 5. 1 | Reverse Current Limits | N/A | N/A | N/A | N/A | N/A | A | Analysis Report (Description of model, parameters and the results of Analysis) | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 5. 2 / 4. 3. 2. 2. 5. 2 | Transients Partially Contained Within The Envelope | N/A | N/A | N/A | N/A | N/A | A | Analysis Report (Description of model, parameters and the results of Analysis) | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 6 / 4. 3. 2. 2. 6 | CIRCUIT PROTECTION DEVICES | | | | | | TITLE | N/A | |
| 3. 2. 2. 6. 1 / 4. 3. 2. 2. 6. 1 | ISS EPS CIRCUIT PROTECTION CHARACTERIS- TICS | | | | | | TITLE | N/A | |
| 3. 2. 2. 6. 1. 1. A / 4. 3. 2. 2. 6. 1. 1. A | Remote Power Controllers (RPCs) | N/A | N/A | N/A | N/A | N/A | T | Test data | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 6. 1. 1. D / 4. 3. 2. 2. 6. 1. 1. D | Remote Power Controllers (RPCs) | A | A | A | N/A | N/A | A | Analysis data. | 4 and 5 have no electrical power interface |
| 3. 2. 2. 6. 1. 1. E / 4. 3. 2. 2. 6. 1. 1. E | Remote Power Controllers (RPCs) | N/A | N/A | N/A | N/A | N/A | A | Analysis data. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 6. 2 / 4. 3. 2. 2. 6. 2 | EPCE RPC INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 2. 2. 6. 2. 1 / 4. 3. 2. 2. 6. 2. 1 | RPC TRIP COODINATION | | | | | | TITLE | N/A | |
| 3. 2. 2. 6. 2. 1. 1 / 4. 3. 2. 2. 6. 2. 1. 1 | Payload Trip Rating | N/A | N/A | N/A | N/A | N/A | T & D | Analysis Data | No Electrical Power Consuming Equipment (EPCE). |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 2. 2. 7 / 4. 3. 2. 2. 7 | EPCE COMPLEX LOAD IMPEDANCES | | | | | | TITLE | N/A | |
| 3. 2. 2. 7. 1. A / 4. 3. 2. 2. 7. 1. A | Interface B | A | A | N/A | N/A | N/A | T | Test report showing compliance with the Unique Payload Hardware ICD. | 1 & 2 Are the only hardware groupings with Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 7. 1. B / 4. 3. 2. 2. 7. 1. B | Interface B | A | A | N/A | N/A | N/A | T | Test report showing compliance with the Unique Payload Hardware ICD. | 1 & 2 Are the only hardware groupings with Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2. 8 / 4. 3. 2. 2. 8 | Large Signal Stability | N/A | N/A | N/A | N/A | N/A | T&A | Analysis and test data for each integrated rack and EPCE. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 2.10. A / 4. 3. 2. 2.10. A | Electrical Load- Stand Alone Stability | A | A | A | N/A | N/A | A | Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required. | 4 and 5 have no electrical power interface |
| 3. 2. 2.10. B / 4. 3. 2. 2.10. B | Electrical Load- Stand Alone Stability | A | A | A | N/A | N/A | A | Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required. | 4 and 5 have no electrical power interface |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 2. 2.10. C / 4. 3. 2. 2.10. C | Electrical Load- Stand Alone Stability | A | A | A | N/A | N/A | A | Analysis report (A brief summary of the results of EMI/EMC tests). A detailed report independent of EMI/EMC request for waiver is necessary to show that stand-alone stability exists if EMI/EMC waivers or deviations are required. | 4 and 5 have no electrical power interface |
| 3. 2. 2.12 / 4. 3. 2. 2.12 | Maximum Load Step Size | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | |
| 3. 2. 3 / 4. 3. 2. 3 | ELECTRICAL POWER CONSUMER CONSTRAINTS | | | | | | TITLE | N/A | |
| 3. 2. 3. 1. B / 4. 3. 2. 3. 1. B | Wire Derating | A | A | A | N/A | N/A | A | Certificate of Compliance. | 4 and 5 have no electrical power interface |
| 3. 2. 3. 1. C / 4. 3. 2. 3. 1. C | Wire Derating | A | A | A | N/A | N/A | I | Certificate of Compliance. | 4 and 5 have no electrical power interface |
| 3. 2. 3. 2. A / 4. 3. 2. 3. 2. A | Exclusive Power Feeds | A | A | N/A | N/A | N/A | A | Certificate of Compliance. | 3, 4, and 5 have no interface to the UIP |
| 3. 2. 3. 2. B / 4. 3. 2. 3. 2. B | Exclusive Power Feeds | A | A | N/A | N/A | N/A | A | Certificate of Compliance. | 3, 4, and 5 have no interface to the UIP |
| 3. 2. 3. 3 / 4. 3. 2. 3. 3 | Loss of Power | N/A | N/A | N/A | N/A | N/A | Safety2 | Certificate of Compliance. | No Electrical Power Consuming Equipment (EPCE). |
| 3. 2. 4 / 4. 3. 2. 4 | Electromagnetic Compatibility | A | A | A | N/A | N/A | T&A&I | 1. Test Report 2. Analysis Report | 4 and 5 have no electrical power interface |
| 3. 2. 4. 1 / 4. 3. 2. 4. 1 | Electrical Grounding | A | A | A | N/A | N/A | T&A | 1. Analysis report showing compliance with SSP 30240 Sec. 3. 2. Certificate of Compliance for the test | 4 and 5 have no electrical power interface |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------|--|---|---|---|---|---|-----------------------------|---|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 2. 4. 2 / 4. 3. 2. 4. 2 | Electrical Bonding | N/A | A | N/A | A | A | T&A&I | 1. Test report showing compliance with SSP 30245, and NSTS 1700.7B/ISS, 213 and 220. 2. Analysis report showing compliance with SSP 30245, NSTS 1700.7B/ISS, 213 and 220, and the Unique Payload Hardware ICD. 3. Certificate of Compliance for the inspection. | 1 and 3 have no direct interface to Interface B |
| 3. 2. 4. 3 / 4. 3. 2. 4. 3 | Cable/Wire Design and Control Requirements | A | A | A | N/A | N/A | I | 1. Analysis report showing compliance with SSP 30242. 2. Certificate of Compliance for the test or inspection. | 4 and 5 have no electrical power interface |
| 3. 2. 4. 4 / 4. 3. 2. 4. 4 | Electromagnetic Interference | A | A | A | N/A | N/A | T&A | 1. Test Report 2. Analysis report for the integrated rack based on sub-rack and/or rack equipment test data. | 4 and 5 have no electrical power interface |
| 3. 2. 4. 5 / 4. 3. 2. 4. 5 | Electrostatic Discharge | A | A | A | N/A | N/A | A&I | 1. A report on test results or an analysis showing compliance during functional testing. 2. Certificate of Compliance (COC) showing that the inspection identifies labeling of integrated rack and EPCE. | 4 and 5 have no electrical power interface |
| 3. 2. 4. 6 / 4. 3. 2. 4. 6 | Alternating Current (ac) Magnetic Fields | A | A | A | N/A | N/A | T | Test results that meet the limits of 3.2.4.6. | 4 and 5 have no electrical power interface |
| 3. 2. 4. 7 / 4. 3. 2. 4. 7 | Direct Current (dc) Magnetic Fields | A | A | A | N/A | N/A | T | Test results that meet the limits of 3.2.4.7. | 4 and 5 have no electrical power interface |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|---|---|---|---|---|---|-----------------------------|---|---|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 2. 4. 8 / 4. 3. 2. 4. 8 | Corona | A | A | A | N/A | N/A | A | 1. Detailed analysis of corona design techniques, voltage levels, and any gases plus operating environment. 2. Test report identifying test configuration plus the test results. | 4 and 5 have no electrical power interface |
| 3. 2. 4. 9 / 4. 3. 2. 4. 9 | Lightning | N/A | N/A | N/A | N/A | N/A | A | Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1. | Does not contain electronics |
| 3. 2. 4.10 / 4. 3. 2. 4.10 | EMI Susceptibility for Safety-Critical Circuits | N/A | N/A | N/A | N/A | N/A | T&A | Analysis report with supporting test data. | No safety critical structures |
| 3. 2. 5 / 4. 3. 2. 5 | SAFETY REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 2. 5. 1 / 4. 3. 2. 5. 1 | PAYLOAD ELECTRICAL SAFETY | | | | | | TITLE | N/A | |
| 3. 2. 5. 1. 1 / 4. 3. 2. 5. 1. 1 | Mating/Demating of Powered Connectors | A | A | A | N/A | N/A | Safety2 | Certificate of Compliance. | 4 and 5 have no electrical power interface |
| 3. 2. 5. 1. 2 / 4. 3. 2. 5. 1. 2 | Safety-Critical Circuits Redundancy | N/A | N/A | N/A | N/A | N/A | Safety2 | Certificate of Compliance. | No EPCE |
| 3. 2. 5. 2. A / 4. 3. 2. 5. 2. A | Rack Maintenance Switch (Rack Power Switch) | N/A | N/A | N/A | N/A | N/A | I | Drawing showing the size and location of the Rack Maintenance Switch (Rack Power Switch) for the inspection. | No interface to RPS |
| 3. 2. 5. 2. B / 4. 3. 2. 5. 2. B | Rack Maintenance Switch (Rack Power Switch) | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 1, 3, 4, and 5 do not interface to J43 connection |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|---|---|---|---|---|---|-----------------------------|----------------------------|--|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 2. 5. 2. C / 4. 3. 2. 5. 2. C | Rack Maintenance Switch (Rack Power Switch) | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No interface to RPS |
| 3. 2. 5. 3. A / 4. 3. 2. 5. 3. A | Power Switches/Controls | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No power switches or controls |
| 3. 2. 5. 3. B / 4. 3. 2. 5. 3. B | Power Switches/Controls | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No power switches or controls |
| 3. 2. 5. 3. C / 4. 3. 2. 5. 3. C | Power Switches/Controls | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No power switches or controls |
| 3. 3 / 4. 3. 3 | COMMAND AND DATA HANDLING INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 3. 2. 1 / 4. 3. 3. 2. 1 | Word/Byte Notations | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3. 3. 2. 2 / 4. 3. 3. 2. 2 | Data Types | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3. 3. 2. 3. A / 4. 3. 3. 2. 3. A | Data Transmissions | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3. 3. 2. 3. B / 4. 3. 3. 2. 3. B | Data Transmissions | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3. 3. 2. 3. C / 4. 3. 3. 2. 3. C | Data Transmissions | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3. 3. 4. 1. A / 4. 3. 3. 4. 1. A | CCSDS Data | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------------------|------------------------|---|---|---|---|---|-----------------------------|---|--|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3.3.4.1. B / 4.3.3.4.1. B | CCSDS Data | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.1. C / 4.3.3.4.1. C | CCSDS Data | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.1.1 / 4.3.3.4.1.1 | CCSDS Data Packets | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.1.1.1 / 4.3.3.4.1.1.1 | CCSDS Primary Header | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.1.1.2. A / 4.3.3.4.1.1.2. A | CCSDS Secondary Header | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.1.1.2. B / 4.3.3.4.1.1.2. B | CCSDS Secondary Header | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.1.2 / 4.3.3.4.1.2 | CCSDS Data Field | N/A | N/A | N/A | N/A | N/A | T | COC for testing. | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.1.3 / 4.3.3.4.1.3 | CCSDS Data Bitstream | N/A | N/A | N/A | N/A | N/A | T | COC for testing. | Data and Video Cables are the only C&DH hardware items |
| 3.3.4.2 / 4.3.3.4.2 | CCSDS TIME CODES | | | | | | TITLE | N/A | |
| 3.3.4.2.1 / 4.3.3.4.2.1 | CCSDS Unsegmented Time | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance for the test. | Data and Video Cables are the only C&DH hardware items |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|------------------------------------|---|---|---|---|---|---|-----------------------------|---|--|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.3.5 / 4.3.3.5 | MIL-STD-1553B Low Rate Data Link (LRDL) | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1 / 4.3.3.5.1 | MIL-STD-1553B PROTOCOL | | | | | | TITLE | N/A | |
| 3.3.5.1.1 / 4.3.3.5.1.1 | Standard Messages | N/A | N/A | N/A | N/A | N/A | I&T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.2 / 4.3.3.5.1.2 | Commanding | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.3.A / 4.3.3.5.1.3.A | Health and Status Data | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.3.B / 4.3.3.5.1.3.B | Health and Status Data | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.4.A / 4.3.3.5.1.4.A | Safety Data | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.4.B / 4.3.3.5.1.4.B | Safety Data | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.4.1.2 / 4.3.3.5.1.4.1.2 | Class 2 - Warning | N/A | N/A | N/A | N/A | N/A | A&T | Data Cert providing analysis and test results. | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.4.1.3 / 4.3.3.5.1.4.1.3 | Class 3 - Caution | N/A | N/A | N/A | N/A | N/A | A&T | Data Cert providing analysis and test results. | Data and Video Cables are the only C&DH hardware items |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|------------------------------------|--|---|---|---|---|---|-----------------------------|--|--|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.3.5.1.4.1.4 / 4.3.3.5.1.4.1.4 | Class 4 - Advisory | N/A | N/A | N/A | N/A | N/A | A&T | Data Cert providing analysis and test results. | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.5 / 4.3.3.5.1.5 | Service Requests | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.7 / 4.3.3.5.1.7 | File Transfer | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.8 / 4.3.3.5.1.8 | Low Rate Telemetry | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.10 / 4.3.3.5.1.10 | Implemented Mode Codes | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.1.12 / 4.3.3.5.1.12 | Illegal Commands | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.2 / 4.3.3.5.2 | MIL-STD-1553B LOW RATE DATA LINK (LRDL) INTERFACE CHARACTERIS- TICS | | | | | | TITLE | N/A | |
| 3.3.5.2.1 / 4.3.3.5.2.1 | LRDL REMOTE TERMINAL ASSIGNMENT | | | | | | TITLE | N/A | |
| 3.3.5.2.1.1 / 4.3.3.5.2.1.1 | LRDL CONNECTOR/PIN ASSIGNMENTS | | | | | | TITLE | N/A | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------------------|---|---|---|---|---|---|-----------------------------|----------------------------|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.3.5.2.1.2. B / 4.3.3.5.2.1.2. B | MIL-STD-1553B Bus A and B Connector/Pin Assignment | N/A | A | N/A | N/A | N/A | I&T | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.5.2.1.2. C / 4.3.3.5.2.1.2. C | MIL-STD-1553B Bus A and B Connector/Pin Assignment | N/A | A | N/A | N/A | N/A | I&T | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.5.2.1.4. A / 4.3.3.5.2.1.4. A | Remote Terminal Hardwired Address Coding | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.2.1.4. B / 4.3.3.5.2.1.4. B | Remote Terminal Hardwired Address Coding | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.2.1.4. C / 4.3.3.5.2.1.4. C | Remote Terminal Hardwired Address Coding | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.2.1.4. D / 4.3.3.5.2.1.4. D | Remote Terminal Hardwired Address Coding | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.5.2.2 / 4.3.3.5.2.2 | LRDL Signal Characteristics | N/A | A | N/A | N/A | N/A | T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3.3.5.2.3. A / 4.3.3.5.2.3. A | LRDL Cabling | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.5.2.3. B / 4.3.3.5.2.3. B | LRDL Cabling | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|----------------------------------|---------------------------------------|---|---|---|---|---|-----------------------------|---------------------------|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.3.5.2.4 / 4.3.3.5.2.4 | Multi-Bus Isolation | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.6 / 4.3.3.6 | MEDIUM RATE DATA LINK (MRDL) | | | | | | TITLE | N/A | |
| 3.3.6.1 / 4.3.3.6.1 | MRDL Protocol | N/A | N/A | N/A | N/A | N/A | I&T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.6.1.1 / 4.3.3.6.1.1 | Integrated Rack Protocols on the MRDL | N/A | N/A | N/A | N/A | N/A | I&T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.6.1.2. A / 4.3.3.6.1.2. A | MRDL Address | N/A | N/A | N/A | N/A | N/A | A&T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.6.1.2. B / 4.3.3.6.1.2. B | MRDL Address | N/A | N/A | N/A | N/A | N/A | A&T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.6.1.2. C / 4.3.3.6.1.2. C | MRDL Address | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.6.1.3. A / 4.3.3.6.1.3. A | ISPR MRDL Connectivity | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3.3.6.1.3. B / 4.3.3.6.1.3. B | ISPR MRDL Connectivity | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.6.1.3. C / 4.3.3.6.1.3. C | ISPR MRDL Connectivity | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|----------------------------------|--|---|---|---|---|---|-----------------------------|----------------------------|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.3.6.1.4. B / 4.3.3.6.1.4. B | MRDL Connector/Pin Assignments | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.6.1.4. C / 4.3.3.6.1.4. C | MRDL Connector/Pin Assignments | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.6.1.5 / 4.3.3.6.1.5 | MRDL Signal Characteristics | N/A | A | N/A | N/A | N/A | I&T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3.3.6.1.6 / 4.3.3.6.1.6 | MRDL Cable Characteristics | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.7.1 / 4.3.3.7.1 | Payload to High Rate Frame Multiplexer (HRFM) Protocols | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.1.1.1 / 4.3.3.7.1.1.1 | Packet Data Frames | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.1.1.2 / 4.3.3.7.1.1.2 | Packet Data Rates | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.1.1.3 / 4.3.3.7.1.1.3 | Packet Format | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.1.2.1 / 4.3.3.7.1.2.1 | Data Frames | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.1.2.2 / 4.3.3.7.1.2.2 | Data Rates | N/A | N/A | N/A | N/A | N/A | T&I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------------------|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.3.7.2.1 / 4.3.3.7.2.1 | Physical Signaling | N/A | N/A | N/A | N/A | N/A | T&A | Data Cert providing rates, signal coding, and control signals. | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.2.1.1. B / 4.3.3.7.2.1.1. B | Physical Signaling Date Rates | N/A | N/A | N/A | N/A | N/A | T | Data Cert providing rates, signal coding, and control signals. | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.2.2 / 4.3.3.7.2.2 | Encoding | N/A | N/A | N/A | N/A | N/A | T | Data Cert providing rates, signal coding, and control signals. | Data and Video Cables are the only C&DH hardware items |
| 3.3.7.3 / 4.3.3.7.3 | INTEGRATED RACK HRDL OPTICAL POWER | | | | | | TITLE | N/A | |
| 3.3.7.3.1 / 4.3.3.7.3.1 | Integrated Rack HRDL Transmitted Optical Power | N/A | A | N/A | N/A | N/A | T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3.3.7.4 / 4.3.3.7.4 | HRDL Fiber Optical Cable | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.7.5 / 4.3.3.7.5 | HRDL Fiber Optical Cable Bend Radius | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.7.6. B / 4.3.3.7.6. B | HRDL Connectors and Fiber | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.7.6. C / 4.3.3.7.6. C | HRDL Connectors and Fiber | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3.3.7.6. D / 4.3.3.7.6. D | HRDL Connectors and Fiber | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|------------------------------|---|---|---|---|---|---|-----------------------------|---------------------------|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.3.7.8 / 4.3.3.7.8 | HRDL State | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.8.3. A / 4.3.3.8.3. A | SSC | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | No laptop hardware |
| 3.3.8.3. B / 4.3.3.8.3. B | SSC | N/A | N/A | N/A | N/A | N/A | D | Certificate of Compliance | No laptop hardware |
| 3.3.10 / 4.3.3.10 | MAINTENANCE SWITCH, SMOKE DETECTOR, SMOKE INDICATOR, AND INTEGRATED RACK FAN INTERFACES | | | | | | TITLE | N/A | |
| 3.3.10.1 / 4.3.3.10.1 | Rack Maintenance Switch (Rack Power Switch) Interfaces | A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.10.2 / 4.3.3.10.2 | Smoke Detector Interfaces | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3.3.10.2.1 / 4.3.3.10.2.1 | Analog Interface Characteristics | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3.3.10.2.2 / 4.3.3.10.2.2 | Discrete Command Built-In-Test Interface Characteristics | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3.3.10.2.3 / 4.3.3.10.2.3 | Smoke Indicator Electrical Interfaces | N/A | A | N/A | N/A | N/A | A&T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|--|---|---|---|---|---|-----------------------------|----------------------------|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 3.10. 2.4 / 4. 3. 3.10. 2. 4 | Fan Ventilation Status Electrical Interfaces | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3. 3.10. 3.B / 4. 3. 3.10.3.B | Rack Maintenance Switch (Rack Power Switch)/Fire Detection Support Interface Connector | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3. 3.10. 3. C / 4. 3. 3.10. 3. C | Rack Maintenance Switch (Rack Power Switch)/Fire Detection Support Interface Connector | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1 / 4. 3. 4. 1 | PAYLOAD NTSC VIDEO INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 4. 1. 1. A / 4. 3. 4. 1. 1. A | Payload NTSC Optical Video Characteristics | N/A | A | N/A | N/A | N/A | T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 1. B / 4. 3. 4. 1. 1. B | Payload NTSC Optical Video Characteristics | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Data and Video Cables are the only C&DH hardware items |
| 3. 4. 1. 1. C / 4. 3. 4. 1. 1. C | Payload NTSC Optical Video Characteristics | N/A | A | N/A | N/A | N/A | T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 2 / 4. 3. 4. 1. 2 | NTSC FIBER OPTIC VIDEO | | | | | | TITLE | N/A | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|---|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 4. 1. 2. 1. A / 4. 3. 4. 1. 2. 1. A | Pulse Frequency Modulation NTSC Fiber Optic Video Characteristics / Payload NTSC Video Characteristics | N/A | A | N/A | N/A | N/A | T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 2. 1. B / 4. 3. 4. 1. 2. 1. B | Pulse Frequency Modulation NTSC Fiber Optic Video Characteristics / Payload NTSC Video Characteristics | N/A | A | N/A | N/A | N/A | T | Data providing PFM fiber optic video signal characteristics. | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 2. 2 / 4. 3. 4. 1. 2. 2 | Integrated Rack NTSC PFM Video Transmitted Optical Power | N/A | A | N/A | N/A | N/A | T | Certificate of Compliance | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 2. 4 / 4. 3. 4. 1. 2. 4 | Fiber Optic Cable Characteristics / NTSC Electrical Video Characteristics | N/A | A | N/A | N/A | N/A | I | Data providing electrical video characteristics. | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 2. 5 / 4. 3. 4. 1. 2. 5 | PFM NTSC Video Fiber Optic Cable Bend Radius | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 2. 7. B / 4. 3. 4. 1. 2. 7. B | PFM NTSC Optical Connector/Pin Assignments | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|---|---|---|---|---|---|-----------------------------|----------------------------|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 4. 1. 2. 7. C / 4. 3. 4. 1. 2. 7. C | PFM NTSC Optical Connector/Pin Assignments | N/A | A | N/A | N/A | N/A | I | Certificate of Compliance. | 2 is the only hardware grouping that contains data and video cables |
| 3. 4. 1. 3 / 4. 3. 4. 1. 3 | NTSC ELECTRICAL VIDEO INTERFACES | | | | | | TITLE | N/A | |
| 3. 4. 1. 4. B / 4. 3. 4. 1. 4. B | NTSC Electrical Connector/Pin Assignments | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No NTSC video |
| 3. 4. 1. 4. C / 4. 3. 4. 1. 4. C | NTSC Electrical Connector/Pin Assignments | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No NTSC video |
| 3. 5 / 4. 3. 5 | THERMAL CONTROL INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 5. 1 / 4. 3. 5. 1 | INTERNAL THERMAL CONTROL SYSTEM (ITCS) INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 5. 1. 2. B / 4. 3. 5. 1. 2. B | ITCS Fluid Charging and Expansion | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No cables with fluid |
| 3. 5. 1. 2. C / 4. 3. 5. 1. 2. C | ITCS Fluid Charging and Expansion | N/A | N/A | N/A | N/A | N/A | I&A | Certificate of Compliance. | No MTL Hoses |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|---|-----------------------------|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 5. 1. 2. D / 4. 3. 5. 1. 2. D | ITCS Fluid Charging and Expansion | N/A | N/A | N/A | N/A | N/A | I&A | Certificate of Compliance. | No MTL Hoses |
| 3. 5. 1. 2. E / 4. 3. 5. 1. 2. E | ITCS Fluid Charging and Expansion | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No cables with fluid |
| 3. 5. 1. 3 / 4. 3. 5. 1. 3 | ITCS PRESSURE DROP | | | | | | TITLE | N/A | |
| 3. 5. 1. 3. 1. A / 4. 3. 5. 1. 3. 1. A | ITCS Pressure Drop - On-Orbit Interfaces | N/A | N/A | N/A | N/A | N/A | T | Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour). | No ITCS interface equipment |
| 3. 5. 1. 3. 1. B / 4. 3. 5. 1. 3. 1. B | ITCS Pressure Drop - On-Orbit Interfaces | N/A | N/A | N/A | N/A | N/A | T | Data Cert providing pressure differentials (in psid) vs. flow rate results (in lbm per hour). | No ITCS interface equipment |
| 3. 5. 1. 4. A / 4. 3. 5. 1. 4. A | Coolant Flow Rate - MTL | N/A | N/A | N/A | N/A | N/A | T | Data Cert providing power data (in kW) and flow rate (in lbm per hour) for each mode of operation in tabular form. | No ITCS interface equipment |
| 3. 5. 1. 6. A / 4. 3. 5. 1. 6. A | Coolant Return Temperature | N/A | N/A | N/A | N/A | N/A | T&A | Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form. | No ITCS interface equipment |
| 3. 5. 1. 6. B / 4. 3. 5. 1. 6. B | Coolant Return Temperature | N/A | N/A | N/A | N/A | N/A | A | Data Cert providing return coolant temperature (in Fahrenheit) and power data (in kW) for each mode of operation in tabular form. | No ITCS interface equipment |
| 3. 5. 1. 6. C / 4. 3. 5. 1. 6. C | Coolant Return Temperature | N/A | N/A | N/A | N/A | N/A | T&A | Data Cert providing return coolant temperature (in Fahrenheit) and power data in(in KW) for each mode of operation in tabular form. | No ITCS interface equipment |

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TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|---------------------------------------|---|---|---|---|---|-----------------------------|--|-----------------------------|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 5. 1. 7. A / 4. 3. 5. 1. 7. A | Coolant Maximum Design Pressure - MTL | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No ITCS interface equipment |
| 3. 5. 1. 8 / 4. 3. 5. 1. 8 | Fail Safe Design | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No ITCS interface equipment |
| 3. 5. 1. 9. A / 4. 3. 5. 1. 9. A | Leakage | N/A | N/A | N/A | N/A | N/A | T | Data Cert providing leakage test results (in scc per hour). | No ITCS interface equipment |
| 3. 5. 1.10 / 4. 3. 5. 1.10 | Quick-Disconnect Air Inclusion | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No MTL hoses |
| 3. 5. 1.11 / 4. 3. 5. 1.11 | Rack Front Surface Temperature | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No ITCS interface equipment |
| 3. 5. 1.12 / 4. 3. 5. 1.12 | Cabin Air Heat Leak | N/A | N/A | N/A | N/A | N/A | A | Data Cert providing integrated rack-to-cabin heat leak analysis results. | No ITCS interface equipment |
| 3. 5. 1.15 / 4. 3. 5. 1.15 | Control System Time Constant | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No ITCS interface equipment |
| 3. 5. 1.16 / 4. 3. 5. 1.16 | Payload Coolant Quantity | N/A | N/A | N/A | N/A | N/A | T | Data Cert providing integrated rack coolant quantity (in liters normalized to the 16.1 degrees C (61 degrees F) reference temperature as provided in the Unique Payload Hardware ICD). | No ITCS interface equipment |
| 3. 6 / 4. 3. 6 | VACUUM SYSTEM REQUIREMENTS | | | | | | TITLE | N/A | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Verifi- cation Method | Required Submittal Data | Comments |
|-------------------------------------|---|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 6. 1 / 4. 3. 6. 1 | VACUUM EXHAUST SYSTEM (VES)/WASTE GAS SYSTEM (WGS) REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 6. 1. 2. A / 4. 3. 6. 1. 2. A | Input Pressure Limit | N/A | N/A | N/A | N/A | N/A | T&A | Certificate of Compliance. | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 2. B / 4. 3. 6. 1. 2. B | Input Pressure Limit | N/A | A | N/A | N/A | A | T&A | Certificate of Compliance. | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 2. C / 4. 3. 6. 1. 2. C | Input Pressure Limit | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 3 / 4. 3. 6. 1. 3 | Input Temperature Limit | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 4 / 4. 3. 6. 1. 4 | Input Dewpoint Limit | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 5. A / 4. 3. 6. 1. 5. A | Acceptable Exhaust Gases | N/A | N/A | N/A | N/A | N/A | A | Data Cert providing constituents of vented gas, volume, concentration, temperature, and pressure | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 5. B / 4. 3. 6. 1. 5. B | Acceptable Exhaust Gases | N/A | N/A | N/A | N/A | N/A | A | Data Cert showing the integrated rack gases vented to the ISS VES/WGS are non-reactive with other vent gas mixture constituents | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 5. C / 4. 3. 6. 1. 5. C | Acceptable Exhaust Gases | N/A | N/A | N/A | N/A | N/A | A | Data Cert showing that integrated racks venting in the ISS VES/WGS provide a means to remove gases that should adhere to the VES/WGS tubing walls. | Only VES/WGS hardware are the hoses. |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 6. 1. 5. D / 4. 3. 6. 1. 5. D | Acceptable Exhaust Gases | N/A | N/A | N/A | N/A | N/A | A | Data Cert Showing that all particulates larger than 100 micrometers are removed prior to venting to the VES/WGS. | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 5. 2 / 4. 3. 6. 1. 5. 2 | External Contamination Control | N/A | N/A | N/A | N/A | N/A | A | Data Cert providing the required list of vented gas characteristics (vented gas constituents, mass, temperature, concentration, maximum particulate size, maximum flow rate, and pressure). | Only VES/WGS hardware are the hoses. |
| 3. 6. 1. 6 / 4. 3. 6. 1. 6 | Payload Vacuum System Access Valve | N/A | N/A | N/A | N/A | N/A | I&A | Certificate of Compliance. | Only VES/WGS hardware are the hoses. |
| 3. 6. 2 / 4. 3. 6. 2 | VACUUM RESOURCE SYSTEM (VRS)/VACUUM VENT SYSTEM (VVS) REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 6. 2. 2. A / 4. 3. 6. 2. 2. A | Input Pressure Limit | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | No VRS/VSS interface |
| 3. 6. 2. 2. B / 4. 3. 6. 2. 2. B | Input Pressure Limit | N/A | NA | N/A | N/A | N/A | T&A | Certificate of Compliance. | No VRS/VSS interface |
| 3. 6. 2. 2. C / 4. 3. 6. 2. 2. C | Input Pressure Limit | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No VRS/VSS interface |
| 3. 6. 2. 3 / 4. 3. 6. 2. 3 | VRS/VVS Through- Put Limit | N/A | N/A | N/A | N/A | NA | T | Certificate of Compliance. | No VRS/VSS interface |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|---|---|---|---|---|---|-----------------------------|---|--|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3. 7 / 4. 3. 7 | PRESSURIZED GASES INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 7. 1 / 4. 3. 7. 1 | NITROGEN INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 7. 1. 1. A / 4. 3. 7. 1. 1. A | Nitrogen Interface Control | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | Only nitrogen interface hardware is the GN2 hose. |
| 3. 7. 1. 1. B / 4. 3. 7. 1. 1. B | Nitrogen Interface Control | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance. | Only nitrogen interface hardware is the GN2 hose. |
| 3. 7. 1. 2 / 4. 3. 7. 1. 2 | Nitrogen Interface MDP | N/A | A | N/A | N/A | A | T&A | Certificate of Compliance. | 2 & 5 contain a GN2 hose |
| 3. 7. 1. 4 / 4. 3. 7. 1. 4 | Nitrogen Leakage | N/A | A | N/A | N/A | A | T | Data Cert providing leakage results in units of each gas used (in scc per sec.). If a representative gas is used to determine leakage (i.e., helium), conversion factors used for the subject gas are to be provided. | 2 & 5 contain a GN2 hose |
| 3. 7. 2 / 4. 3. 7. 2 | ARGON INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 7. 3 / 4. 3. 7. 3 | CARBON DIOXIDE INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 7. 4 / 4. 3. 7. 4 | HELIUM INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------|--|---|---|---|---|---|-----------------------------|--|---------------------------|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3. 7. 5 / 4. 3. 7. 5 | Pressurized Gas Systems | N/A | N/A | N/A | N/A | N/A | A | Data Cert providing maximum credible leak rate (in slpm) for each bottle. | No pressurized gas system |
| 3. 7. 6 / 4. 3. 7. 6 | Manual Valves | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | No manual valves |
| 3. 8 / 4. 3. 8 | PAYLOAD SUPPORT SERVICES INTERFACES REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 8. 1 / 4. 3. 8. 1 | POTABLE WATER | | | | | | TITLE | N/A | |
| 3. 9 / 4. 3. 9 | ENVIRONMENT INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 9. 1 / 4. 3. 9. 1 | ATMOSPHERE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3. 9. 1. 1 / 4. 3. 9. 1. 1 | Pressure | A | A | A | A | A | Safety ² | Certificate of Compliance. | |
| 3. 9. 1. 2 / 4. 3. 9. 1. 2 | Temperature | A | A | A | A | A | Safety ² | Certificate of Compliance. | |
| 3. 9. 1. 3 / 4. 3. 9. 1. 3 | Humidity | A | A | A | A | A | A | Analysis report including: - Description of condensation collection system. - Illustration of all components or surfaces where condensation is most likely to occur. - Upper humidity limit in terms of dewpoint. - All rack surface temperature | November 2010 |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.9.2 / 4.3.9.2 | INTEGRATED RACK USE OF CABIN ATMOSPHERE | | | | | | TITLE | N/A | |
| 3.9.2.2 / 4.3.9.2.2 | Oxygen Consumption | N/A | N/A | N/A | N/A | N/A | A | Data Cert providing the integrated rack oxygen consumption analysis results. | No oxygen consumption |
| 3.9.2.3 / 4.3.9.2.3 | Chemical Releases | A | A | A | A | A | Safety ² | Certificate of Compliance. | |
| 3.9.3 / 4.3.9.3 | RADIATION REQUIREMENTS | | | | | | TITLE | N/A | |
| 3.9.3.1 / 4.3.9.3.1 | Integrated Rack Contained or Generated Ionizing Radiation | N/A | N/A | N/A | N/A | N/A | Safety ² | Certificate of Compliance. | No ionizing radiation |
| 3.9.3.3 / 4.3.9.3.3 | Single Event Effect (SEE) Ionizing Radiation | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | No ionizing radiation |
| 3.10 / 4.3.10 | FIRE PROTECTION INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3.10.1 / 4.3.10.1 | Fire Prevention | A | A | A | A | A | Safety ² | Certificate of Compliance | |
| 3.10.2 / 4.3.10.2 | Payload Monitoring and Detection Requirements | N/A | N/A | N/A | N/A | N/A | Safety ² | Certificate of Compliance | Monitoring and smoke detector interface equipment is only at FDS umbilical |
| 3.10.2.1 / 4.3.10.2.1 | SMOKE DETECTION | | | | | | TITLE | N/A | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|-----------------------------------|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.10. 2. 1. 1. A / 4. 3.10. 2. 1. 1. A | Smoke Detector | N/A | N/A | N/A | N/A | N/A | I | COC for ISS provided smoke detectors or Analysis report for PD provided smoke detectors. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 1. 1. B / 4. 3.10. 2. 1. 1. B | Smoke Detector | N/A | A | N/A | N/A | N/A | I&D | Certificate of Compliance | 2 contains an FDS umbilical |
| 3.10. 2. 1. 2 / 4. 3.10. 2. 1. 2 | Forced Air Circulation Indication | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance for forced air circulation. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 1. 3. A / 4. 3.10. 2. 1. 3. A | Fire Detection Indicator | N/A | N/A | N/A | N/A | N/A | T&I | Drawing and a COC showing the size and location of the fire detection indicator. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 1. 3. B / 4. 3.10. 2. 1. 3. B | Fire Detection Indicator | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance for fire detection indicators and sensors. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 2 / 4. 3.10. 2. 2 | PARAMETER MONITORING | | | | | | TITLE | N/A | |
| 3.10. 2. 2. 1 / 4. 3.10. 2. 2. 1 | Parameter Monitoring Use | N/A | N/A | N/A | N/A | N/A | I&A | Certificate of Compliance | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 2. 2 / 4. 3.10. 2. 2. 2 | PARAMETER MONITORING RESPONSE | | | | | | TITLE | N/A | |
| 3.10. 2. 2. 2. 1. A / 4. 3.10. 2. 2. 2. 1. A | Parameter Monitoring in Subrack | N/A | N/A | N/A | N/A | N/A | T | Test report including test data. | Monitoring and smoke detector interface equipment is only a FDS umbilical |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.10. 2. 2. 2. 1. B / 4. 3.10. 2. 2. 2. 1. B | Parameter Monitoring in Subrack | N/A | N/A | N/A | N/A | N/A | T&A | Test report including test data. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 2. 2. 1. C / 4. 3.10. 2. 2. 2. 1. C | Parameter Monitoring in Subrack | N/A | N/A | N/A | N/A | N/A | T&A | Test report including test data. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 2. 2. 2. A / 4. 3.10. 2. 2. 2. 2. A | Parameter Monitoring in Integrated Rack | N/A | N/A | N/A | N/A | N/A | T | Test report including test data. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 2. 2. 2. B / 4. 3.10.2. 2. 2. 2. B | Parameter Monitoring in Integrated Rack | N/A | N/A | N/A | N/A | N/A | T | Test report including test data. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 2. 2. 2. 2. C / 4. 3.10.2. 2. 2. 2. C | Parameter Monitoring in Integrated Rack | N/A | N/A | N/A | N/A | N/A | T&A | Test report including test data. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 3. 1. A / 4. 3.10. 3. 1. A | Portable Fire Extinguisher | N/A | N/A | N/A | N/A | N/A | I&A | 1. Drawings showing the size and location of the fire suppression access port. 2. Certificate of Compliance | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 3. 2 / 4. 3.10. 3. 2 | Fire Suppression Access Port Accessibility | N/A | N/A | N/A | N/A | N/A | D | Certificate of Compliance | Monitoring and smoke detector interface equipment is only a FDS umbilical |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------------------|--|---|---|---|---|---|-----------------------------|--|---|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.10. 3. 3 / 4. 3.10. 3. 3 | Fire Suppressant Distribution | N/A | N/A | N/A | N/A | N/A | T | Certificate of Compliance | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 4. A / 4. 3.10. 4. A | Labeling | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.10. 4. B / 4. 3.10. 4. B | Labeling | N/A | N/A | N/A | N/A | N/A | I | Drawing and a COC showing the size and location of the fire detection indicator. | Monitoring and smoke detector interface equipment is only a FDS umbilical |
| 3.11 / 4. 3.11 | MATERIALS AND PARTS INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3.11. 1 / 4. 3.11. 1 | Materials and Parts Use and Selection | A | A | A | A | A | Safety ² | Certificate of Compliance. | |
| 3.11. 2 / 4. 3.11. 2 | FLUIDS | | | | | | TITLE | N/A | |
| 3.11. 2. 1. A. / 4. 3.11. 2. 1. A | Fluid Chemical Composition | N/A | N/A | N/A | N/A | N/A | T | Test report including test results. | ITCS fluid will be launched with the integrated rack |
| 3.11. 2. 1. B. / 4. 3.11. 2. 1. B | Fluid Chemical Composition | N/A | A | N/A | N/A | A | I&T | Certificate of Compliance. | 2 and 5 contain GN interface hoses |
| 3.11. 2. 2. A. / 4. 3.11. 2. 2. A | Fluid System Cleanliness | N/A | N/A | N/A | N/A | N/A | I | Certificate of Compliance. | Does not connect to ITCS |
| 3.11. 2. 2. B. / 4. 3.11. 2. 2. B | Fluid System Cleanliness | N/A | A | N/A | N/A | A | I | Certificate of Compliance. | 2 and 5 contain GN interface hoses |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------------------|---|---|---|---|---|---|-----------------------------|----------------------------|---------------------------------|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.11. 2. 3. A. / 4. 3.11. 2. 3. A | Thermal Cooling System Wetted Materials | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | Only ITCS interface is hoses |
| 3.11. 2. 3. B. / 4. 3.11. 2. 3. B | Thermal Cooling System Wetted Materials | N/A | N/A | N/A | N/A | N/A | A | Certificate of Compliance. | Only ITCS interface is hoses |
| 3.11. 2. 3. C. / 4. 3.11. 2. 3. C | Thermal Cooling System Wetted Materials | N/A | N/A | N/A | N/A | N/A | A or T | Certificate of Compliance. | Only ITCS interface is hoses |
| 3.11. 3 / 4. 3.11. 3 | Cleanliness | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.11. 4 / 4. 3.11. 4 | Fungus Resistant Material | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12 / 4. 3.12 | HUMAN FACTORS INTERFACE REQUIREMENTS | | | | | | TITLE | N/A | |
| 3.12. 1. A / 4. 3.12. 1. A | Strength Requirements | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 1. B / 4. 3.12. 1. B | Strength Requirements | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 2 / 4. 3.12. 2 | BODY ENVELOPE AND REACH ACCESSIBILITY | | | | | | TITLE | N/A | |
| 3.12. 2. 1 / 4. 3.12. 2. 1 | Adequate Clearance | A | A | A | A | A | D | Certificate of Compliance. | ember 2010 |
| 3.12. 2. 2. A / 4. 3.12. 2. 2. A | Accessibility | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 2. 2. B / 4. 3.12. 2. 2. B | Accessibility | A | A | A | A | A | D | Certificate of Compliance. | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|---|-------------------|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.12. 2. 3 / 4. 3.12. 2. 3 | Full Size Range Accommodation | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 3 / 4. 3.12. 3 | HABITABILITY | | | | | | TITLE | N/A | |
| 3.12. 3. 1 / 4. 3.12. 3. 1 | HOUSEKEEPING | | | | | | TITLE | N/A | |
| 3.12. 3. 1. 1 / 4. 3.12. 3. 1. 1 | Closures and Covers | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 3. 1. 2. A / 4. 3.12. 3. 1. 2. A | Built-In Control | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 3. 1. 2. B / 4. 3.12. 3. 1. 2. B | Built-In Control | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 3. 1. 5 / 4. 3.12. 3. 1. 5 | One-Handed Operation | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 3. 2 / 4. 3.12. 3. 2 | Touch Temperature | | | | | | TITLE | N/A | |
| 3.12. 3. 2. 1 / 4. 3.12. 3. 2. 1 | Continuous/Incidental Contact - High Temperature | N/A | N/A | N/A | N/A | N/A | Safety ² | Certificate of Compliance. | No heat source |
| 3.12. 3. 2. 2 / 4. 3.12. 3. 2. 2 | Continuous/Incidental Contact - Low Temperature | N/A | N/A | N/A | N/A | N/A | Safety ² | Certificate of Compliance. | No cooling source |
| 3.12. 3. 3. 1. B / 4. 3.12. 3. 3. 1. B | Continuous Noise Limits - Sub racks Changed Out | N/A | N/A | N/A | N/A | N/A | A* | Acoustics summary that includes a list of potential noise sources and their locations. Continuous Noise Source - SPL (dB) for the eight octave bands | No noise sources |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|--|------------------|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.12. 3. 3. 2. A / 4. 3.12. 3. 3. 2. A | Intermittent Noise Limits – Integrated Racks That Do Not Have Crew Operations Within the Rack Volume | N/A | N/A | N/A | N/A | N/A | A* | Acoustics summary that includes a list of potential noise sources and their locations. Intermittent Noise Source - Overall A-weighted SPL (dBA) | No noise sources |
| 3.12. 3. 4. A / 4. 3.12. 3. 4. A | Lighting Design | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 3. 4. B / 4. 3.12. 3. 4. B | Lighting Design | A | A | A | A | A | T | Certificate of Compliance. | |
| 3.12. 3. 4. D / 4. 3.12. 3. 4. D | Lighting Design | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 3. 4. E / 4. 3.12. 3. 4. E | Lighting Design | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4 / 4. 3.12. 4 | STRUCTURAL/ MECHANICAL INTERFACES | | | | | | TITLE | N/A | |
| 3.12. 4. 2 / 4. 3.12. 4. 2 | PAYLOAD HARDWARE MOUNTING | | | | | | TITLE | N/A | |
| 3.12. 4. 2. 1 / 4. 3.12. 4. 2. 1 | Equipment Mounting | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 4. 2. 2 / 4. 3.12. 4. 2. 2 | Drawers and Hinged Panels | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4. 2. 5 / 4. 3.12. 4. 2. 5 | Alignment | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4. 2. 6 / 4. 3.12. 4. 2. 6 | Slide-out Stops | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 4. 2. 7 / 4. 3.12. 4. 2. 7 | Push-Pull Forces | A | A | A | A | A | A | Certificate of Compliance. | |

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TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------------------|--------------------------------|---|---|---|---|---|-----------------------------|----------------------------|----------|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3.12.4.2.8 / 4.3.12.4.2.8 | Access | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12.4.2.8.1.A / 4.3.12.4.2.8.1.A | Covers | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.2.8.1.B / 4.3.12.4.2.8.1.B | Covers | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.2.8.2 / 4.3.12.4.2.8.2 | Self-Supporting Covers | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.3 / 4.3.12.4.3 | CONNECTORS | | | | | | TITLE | N/A | |
| 3.12.4.3.1 / 4.3.12.4.3.1 | One-Handed Operation | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12.4.3.2.A1 / 4.3.12.4.3.2.A1 | Accessibility | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12.4.3.2.A2 / 4.3.12.4.3.2.A2 | Accessibility | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12.4.3.2.B / 4.3.12.4.3.2.B | Accessibility | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.3.3.A / 4.3.12.4.3.3.A | Ease of Disconnect | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.3.3.B / 4.3.12.4.3.3.B | Ease of Disconnect | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.3.4 / 4.3.12.4.3.4 | Indication of Pressure/Flow | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.3.5 / 4.3.12.4.3.5 | Self Locking | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.4.3.6.A / 4.3.12.4.3.6.A | Connector Arrangement | A | A | A | A | A | I | Certificate of Compliance. | |

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TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|---|---|---|---|---|---|-----------------------------|----------------------------|----------|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3.12. 4. 3. 6. B / 4. 3.12. 4. 3. 6. B | Connector Arrangement | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 3. 7 / 4. 3.12. 4. 3. 7 | Arc Containment | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4. 3. 8 / 4. 3.12. 4. 3. 8 | Connector Protection | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4. 3. 9 / 4. 3.12. 4. 3. 9 | Connector Shape | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4. 3.10 / 4. 3.12. 4. 3.10 | Fluid and Gas Line Connectors | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4.3.11 / 4. 3.12. 4. 3.11 | Alignment Marks or Guide Pins | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4.3.12. A / 4. 3.12. 4. 3.12. A | Coding | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4.3.12. B / 4. 3.12. 4.3.12. B | Coding | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 3.13 / 4. 3.12. 4. 3.13 | Pin Identification | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 3.14 / 4. 3.12. 4. 3.14 | Orientation | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4. 3.15. A / 4. 3.12. 4. 3.15. A | Hose/Cable Restraints | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 3.15. B / 4. 3.12. 4. 3.15. B | Hose/Cable Restraints | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 3.15. D / 4. 3.12. 4. 3.15. D | Hose/Cable Restraints | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4 / 4. 3.12. 4. 4 | FASTENERS | | | | | | TITLE | N/A | |
| 3.12. 4. 4. 1 / 4. 3.12. 4. 4. 1 | Non-Threaded Fastener Status Indication | A | A | A | A | A | D | Certificate of Compliance. | |

TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|---|---|---|---|---|---|-----------------------------|----------------------------|----------|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3.12. 4. 4. 2 / 4. 3.12. 4. 4. 2 | Mounting Bolt/Fastener Spacing | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 4 / 4. 3.12. 4. 4. 4 | Multiple Fasteners | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 5 / 4. 3.12. 4. 4. 5 | Captive Fasteners | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 4. 4. 6. A / 4. 3.12. 4. 4. 6. A | Quick Release Fasteners | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 6. B / 4. 3.12. 4. 4. 6. B | Quick Release Fasteners | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 7 / 4. 3.12. 4. 4. 7 | Threaded Fasteners | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 8. A / 4. 3.12. 4. 4. 8. A | Over Center Latches - Nonself-latching | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 8. B / 4. 3.12. 4. 4. 8. B | Over Center Latches - Latch Lock | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 8. C / 4. 3.12. 4. 4. 8. C | Over Center Latches - Latch Handles | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4. 9 / 4. 3.12. 4. 4. 9 | Winghead Fasteners | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4.11. A / 4. 3.12. 4. 4.11. A | Fastener Head Type | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4.11. B / 4. 3.12. 4. 4.11. B | Fastener Head Type | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4.11. C / 4. 3.12. 4. 4.11. C | Fastener Head Type | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 4. 4.12 / 4. 3.12. 4. 4.12 | One-Handed Actuation | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 4. 4.14 / 4. 3.12. 4. 4.14 | Access Holes | A | A | A | A | A | I | Certificate of Compliance. | |

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TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|-------------------------------------|---|---|---|---|---|---|-----------------------------|----------------------------|----------|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3.12. 5 / 4. 3.12. 5 | CONTROLS AND DISPLAYS | | | | | | TITLE | N/A | |
| 3.12. 5. 1 / 4. 3.12. 5. 1 | Controls Spacing Design Requirements | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 2 / 4. 3.12. 5. 2 | ACCIDENTAL ACTUATION | | | | | | TITLE | N/A | |
| 3.12. 5. 2. 1 / 4. 3.12. 5. 2. 1 | Protective Methods | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 2. 2 / 4. 3.12. 5. 2. 2 | Noninterference | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 2. 4 / 4. 3.12. 5. 2. 4 | Barrier Guards | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 2. 5 / 4. 3.12. 5. 2. 5 | Recessed Switch Protection | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 2. 7 / 4. 3.12. 5. 2. 7 | Position Indication | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 2. 8 / 4. 3.12. 5. 2. 8 | Hidden Controls | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 2. 9 / 4. 3.12. 5. 2. 9 | Hand Controllers | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 3. A / 4. 3.12. 5. 3. A | Valve Controls - Low Torque Valves | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 3. B / 4. 3.12. 5. 3. B | Valve Controls - Intermediate Torque Valves | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 3. C / 4. 3.12. 5. 3. C | Valve Controls - High Torque Valves | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 3. D / 4. 3.12. 5. 3. D | Valve Controls - Handle Dimensions | A | A | A | A | A | I | Certificate of Compliance. | |

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TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|---|----------|
| | | Hard- ware Group- ing ₁ | Hard- ware Group- ing ₂ | Hard- ware Group- ing ₃ | Hard- ware Group- ing ₄ | Hard- ware Group- ing ₅ | | | |
| 3.12. 5. 3. E / 4. 3.12. 5. 3. E | Valve Controls - Rotary Valve Controls | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 5. 4 / 4. 3.12. 5. 4 | Toggle Switches | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 6 / 4. 3.12. 6 | Restraints and Mobility Aids | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 6. 3 / 4. 3.12. 6. 3 | Captive Parts | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 6. 4 / 4. 3.12. 6. 4 | HANDLE AND GRASP AREA DESIGN REQUIREMENTS | | | | | | TITLE | N/A | |
| 3.12. 6. 4. 1 / 4. 3.12. 6. 4. 1 | Handles and Restraints | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 6. 4. 3 / 4. 3.12. 6. 4. 3 | Handle Location/Front Access | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 6. 4. 4 / 4. 3.12. 6. 4. 4 | Handle Dimensions | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 6. 4. 5. A / 4. 3.12. 6. 4. 5. A | Non-Fixed Handles Design Requirements | A | A | A | A | A | A&D | Certificate of Compliance. | |
| 3.12. 6. 4. 5. B / 4. 3.12. 6. 4. 5. B | Non-Fixed Handles Design Requirements | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 6. 4. 5. C / 4. 3.12. 6. 4. 5. C | Non-Fixed Handles Design Requirements | A | A | A | A | A | I&D | Certificate of Compliance. | |
| 3.12. 7 / 4. 3.12. 7 | Identification Labeling | A | A | A | A | A | I | Certificate of Compliance showing Form 732 approval. | |

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TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|---|--|---|---|---|---|---|-----------------------------|----------------------------|----------|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.12. 8 / 4. 3.12. 8 | Color | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 9 / 4. 3.12. 9 | Crew Safety | A | A | A | A | A | Safety ² | Certificate of Compliance. | |
| 3.12. 9. 1 / 4. 3.12. 9. 1 | Electrical Hazards | | | | | | TITLE | N/A | |
| 3.12. 9. 1. 1 / 4. 3.12. 9. 1. 1 | Mismatched | A | A | A | A | A | A&I&D | Certificate of Compliance. | |
| 3.12. 9. 1. 4. 1 / 4. 3.12. 9. 1. 4. 1 | Device Accessibility | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 9. 1. 4. 2 / 4. 3.12. 9. 1. 4. 2 | Extractor-Type Fuse Holder | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 9. 1. 4. 3 / 4. 3.12. 9. 1. 4. 3 | Overload Protection Location | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 9. 1. 4. 4 / 4. 3.12. 9. 1. 4. 4 | Overload Protection Identification | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 9. 1. 4. 5 / 4. 3.12. 9. 1. 4. 5 | Automatic Restart Protection | A | A | A | A | A | D | Certificate of Compliance. | |
| 3.12. 9. 2 / 4. 3.12. 9. 2 | Sharp Edges and Corners Protection | A | A | A | A | A | Safety ² | Certificate of Compliance. | |
| 3.12. 9. 3 / 4. 3.12. 9. 3 | Holes | A | A | A | A | A | A&I | Certificate of Compliance. | |
| 3.12. 9. 4 / 4. 3.12. 9. 4 | Latches | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12. 9. 5 / 4. 3.12. 9. 5 | Screws and Bolts | A | A | A | A | A | A&I | Certificate of Compliance. | |
| 3.12. 9. 6 / 4. 3.12. 9. 6 | Securing Pins | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12. 9. 7 / 4. 3.12. 9. 7 | Levers, Cranks, Hooks, and Controls | A | A | A | A | A | A&I | Certificate of Compliance. | |

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TABLE 4.2-3 CIR PRE-LAUNCHED HARDWARE REQUIREMENTS MATRIX (46 PAGES)

| IRD Number | IRD Requirement | Applicability | | | | | Veri- fication Method | Required Submittal Data | Comments |
|--------------------------------|----------------------------------|---|---|---|---|---|-----------------------------|----------------------------|----------|
| | | Hard- ware Group- ing ¹ | Hard- ware Group- ing ² | Hard- ware Group- ing ³ | Hard- ware Group- ing ⁴ | Hard- ware Group- ing ⁵ | | | |
| 3.12.9.8 / 4.3.12.9.8 | Burrs | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12.9.9. A / 4.3.12.9.9. A | Locking Wires | A | A | A | A | A | A | Certificate of Compliance. | |
| 3.12.9.9. B / 4.3.12.9.9. B | Locking Wires | A | A | A | A | A | I | Certificate of Compliance. | |
| 3.12.9.12 / 4.3.12.9.12 | Egress | A | A | A | A | A | Safety ² | Certificate of Compliance. | |
| 3.12.10 / 4.3.12.10 | Payload In-Flight Maintenance | A | A | A | A | A | A | Certificate of Compliance. | |

Note 1: Integrated racks with on-orbit configuration changes will require re-verification by the rack integrator for MPLM descent.

Note 2: Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report to the PSRP. These verifications will be reported within OZ using PSRP documentation; therefore no data submittal from the PD is required for these safety verifications unless specifically agreed to or requested.

Note 3: The following Non-verifiable Requirements (NVR) have been removed from the applicability matrix: 3.1.1.4.D, 3.1.2, 3.1.2.4, 3.1.2.6, 3.1.3, 3.2.1, 3.2.2.1.A, 3.2.2.1.D, 3.2.2.1.G, 3.2.2.5, 3.2.6, 3.2.6.2.E, 3.2.6.2.1.A, 3.2.6.5.E, 3.3.2, 3.3.4, 3.3.4.1.4, 3.3.4.2.2, 3.3.5.1.4.1, 3.3.5.1.4.1.1, 3.3.5.1.6, 3.3.5.1.9, 3.3.5.2.1.2.A, 3.3.6.1.4.A, 3.3.7, 3.3.7.1.1, 3.3.7.1.2, 3.3.7.2, 3.3.7.2.1.1.C, 3.3.7.6.A, 3.3.8, 3.3.8.2.1.A, 3.3.8.2.1.B, 3.3.9, 3.3.10.3.A, 3.4, 3.4.1.2.7.A, 3.4.1.4.A, 3.4.2, 3.5.1.1.A, 3.5.1.1.B, 3.5.1.5.A, 3.5.1.5.B, 3.6.1.1, 3.6.1.5.1.A, 3.6.1.5.1.B, 3.6.1.5.1.C, 3.6.2.1, 3.6.2.4, 3.7.1.3, 3.7.1.5, 3.7.2.3, 3.7.2.5, 3.7.3.3, 3.7.3.5, 3.7.4.3, 3.7.4.5, 3.8.1.1, 3.9.3.4, 3.9.3.2, 3.9.4, 3.10.3, 3.11.5, 3.12.3.3, 3.12.4.3.15.C, 3.12.5.2.3, 3.12.9.1.4, 3.12.9.1.3, 3.12.9.1.4

Note 4: The following DELETED Requirements have been removed from the applicability matrix: 3.1.1.4.G, 3.1.1.4.H, 3.1.1.4.J, 3.1.1.2.C, 3.1.1.2.D, 3.2.2.9, 3.2.2.11, 3.2.5.4, 3.3.1, 3.3.3, 3.3.5.2.1.3, 3.3.7.2.1.1.A, 3.3.7.7, 3.4.1.2.6, 3.5.1.2.A, 3.12.3.1.3, 3.12.3.1.4, 3.12.4.1, 3.12.4.2.3, 3.12.4.2.4, 3.12.4.2.8, 3.12.4.4.3, 3.12.4.4.10, 3.12.4.4.13, 3.12.5.2.6, 3.12.6.4.2, 3.12.9.1.2, 3.12.9.1.3, 3.12.9.1.5, 3.12.9.1.5.1, 3.12.9.10.B, 3.12.9.11

Note 5: The following requirements that are N/A to the integrated rack have been removed from the applicability matrix: 3.1.1.4.F, 3.1.1.4.P, 3.1.1.4.Q, 3.1.1.4.S, 3.1.1.4.1.A, 3.1.1.4.1.B, 3.1.1.4.1.C, 3.1.1.4.1.D, 3.1.1.7.5.A, 3.1.1.7.5.B, 3.1.2.5, 3.2.1.1.2, 3.2.1.3.2, 3.2.2.1.B, 3.2.2.1.C, 3.2.2.1.E, 3.2.2.1.F, 3.2.2.1.H, 3.2.2.1.I, 3.2.2.6.1.1.B, 3.2.2.6.1.1.C, 3.2.2.7.2, 3.2.3.1.A, 3.2.5.5.A, 3.2.5.5.B, 3.2.6.1.A, 3.2.6.1.B, 3.2.6.1.C, 3.2.6.1.D, 3.2.6.1.E, 3.2.6.1.F, 3.2.6.1.G, 3.2.6.2.A, 3.2.6.2.B, 3.2.6.2.C, 3.2.6.2.D, 3.2.6.2.F, 3.2.6.2.1.B, 3.2.6.2.1.C, 3.2.6.2.2, 3.2.6.2.3.A, 3.2.6.2.3.B, 3.2.6.2.3.C, 3.2.6.2.3.D, 3.2.6.2.4, 3.2.6.2.5, 3.2.6.3.A, 3.2.6.3.B, 3.2.6.3.C, 3.2.6.3.D, 3.2.6.4.A, 3.2.6.4.B, 3.2.6.4.C, 3.2.6.4.D, 3.2.6.4.E, 3.2.6.4.F, 3.2.6.4.G, 3.2.6.4.H, 3.2.6.4.I, 3.2.6.4.J

3.2.6.4.1, 3.2.6.5.A, 3.2.6.5.B, 3.2.6.5.C, 3.2.6.5.D, 3.2.6.5.F, 3.3.5.1.3.C, 3.3.5.1.3.D, 3.3.5.1.3.E, 3.3.5.1.11, 3.3.7.3.2, 3.3.8.1.A, 3.3.8.1.B, 3.3.8.1.C, 3.3.8.1.D, 3.3.8.1.E, 3.3.8.1.F, 3.3.8.1.G, 3.3.8.1.H, 3.3.8.2.A, 3.3.8.2.B, 3.3.8.2.C, 3.3.8.2.2.A, 3.3.8.2.2.B, 3.3.8.2.2.C, 3.3.8.2.2.D, 3.4.1.3.1, 3.4.1.3.2, 3.4.1.3.3, 3.4.1.3.4, 3.5.1.3.2, 3.5.1.4.B, 3.5.1.6.D, 3.5.1.7.B, 3.5.1.7.C, 3.5.1.9.B, 3.5.1.13, 3.5.1.14.A, 3.5.1.14.B, 3.7.2.1.A, 3.7.2.1.B, 3.7.2.2, 3.7.2.4, 3.7.3.1.A, 3.7.3.1.B, 3.7.3.2, 3.7.3.4, 3.7.4.1.A, 3.7.4.1.B, 3.7.4.2, 3.7.4.4, 3.8.1.2, 3.8.1.3.A, 3.8.1.3.B, 3.9.2.1.A, 3.9.2.1.B, 3.9.3.4.1, 3.9.3.4.2, 3.10.3.1.B, 3.11.2.1.C, 3.11.2.1.D, 3.11.2.1.E, 3.11.2.2.C, 3.11.2.2.D, 3.11.2.2.E, 3.12.3.3.1.A, 3.12.3.3.1.C, 3.12.3.3.1.D, 3.12.3.3.2. B, 3.12.3.4.C, 3.12.4.2.8.4, 3.12.6.1.A, 3.12.6.1.B, 3.12.6.1.C, 3.12.6.2.A, 3.12.6.2.B, 3.12.9.10.A, 3.12.9.10.C, 3.12.9.10.D

The column for “Submittal Date” has been removed. All Verifications are required to be submitted at L-3.5 months.

The requirements in Table 4.2-3 are per SSP 57000 Rev. G and are not applicable for the launch phase of the hardware.

TABLE 4.2-4 CIR PRE-POSITIONED ATV LAUNCH REQUIREMENTS (2 PAGES)

| Requirement Number | Requirement Title | Payload Applicability | Verification Method | Data Delivery | Comments |
|---------------------------|--|------------------------------|----------------------------|-------------------------------|------------------------------|
| I.1.3.1.1 | Power | A | A | Analysis Report | |
| I.1.3.1.1.1.1 | Electrical Hazard | N/A | A | COC | No battery powered equipment |
| I.1.3.1.1.1.2 | Leakage Current | N/A | A | COC | No battery powered equipment |
| I.1.3.1.1.1.3 | Voltage | N/A | A | COC | No battery powered equipment |
| I.1.3.1.1.1.4 | Protective Covers | N/A | A | Analysis Report | No battery powered equipment |
| I.1.3.1.1.1.5 | Grounding | NVR | NVR | NVR | |
| I.1.3.1.1.1.6 | Static Discharge | N/A | A | Analysis Report | No battery powered equipment |
| I.1.3.1.1.1.7.1 | Radiated Emissions | N/A | T | Test Data | No battery powered equipment |
| I.1.3.1.1.1.7.2 | Radiated Susceptibility | N/A | T | Test Data | No battery powered equipment |
| I.1.3.1.2 | Thermal | A | A | COC | |
| I.1.3.1.3 | Rack Internal Cargo Acceleration Environment | A | T & A | Analysis Report & Test Data | |
| I.1.3.1.4 | Rack External Cargo Acceleration Environment | A | T or A | Analysis Report or Test Data | |
| I.1.3.1.5 | Random Vibration Environment | A | T & A | Analysis Report and Test Data | |
| I.1.3.1.6 | Sinusoidal / Shock Environment | A | T & A | Analysis Report & Test Data | |
| I.1.3.1.7 | Temperature Environment | A | T or A | Analysis Report | |
| I.1.3.1.8 | Humidity Environment | A | T or A | Analysis Report | |
| I.1.3.1.9 | Pressure Environment (Nominal Data) | A | T or A | Analysis Report | |
| I.1.3.1.10 | Pressure Environment (Contingency Data) | A | T or A | Analysis Report | |
| I.1.3.2 | Cleaning Methods | A | T | COC | |
| I.1.3.3 | Depressurization / Repressurization | A | A | Analysis Report | |

TABLE 4.2-4 CIR PRE-POSITIONED ATV LAUNCH REQUIREMENTS (2 PAGES)

| Requirement Number | Requirement Title | Payload Applicability | Verification Method | Data Delivery | Comments |
|--------------------|----------------------------------|-----------------------|---------------------|---|---------------------------|
| I.1.3.4.2 | Pressurized Cargo Leak Rate Data | N/A | A | Data Cert. including nominal and worst-case contingency leak rate | No pressurized containers |
| I.1.3.5 | Ionizing Radiation | A | A | Analysis Report | |

Note ¹: The Requirements in Table 4.2-5 apply to all hardware groupings (1-5) in Table 4.2-2.

**TABLE 4.2-5 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR CIR PRE-POSITIONED MIDDECK TRANSPORT
(I.E. MIDDECK PASSIVE STOWED) ¹ (6 PAGES)**

| 52000 IDD Number / VRDS Cross-Reference | IDD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date | Comments |
|---|--------------------------------------|-----------------------|---------------------|-----------------------------|-------------------------|--|
| 3.4.2 / ME-ER-002 | Standard Modular Locker | N/A | I | 1. COC 2. COC | L-4.5 L-4.5 | Payload Hardware does not use a Modular Locker |
| 3.4.2.3A / ME-ER-002/ HF-ER-037 | Payload Zero-G Requirements | N/A | A & I | COC | L-4.5 | Payload Hardware does not use a Tray/Locker |
| 3.4.2.4 / ME-ER-002 | Isolation Material Properties | N/A | A | COC | L-4.5 | Payload Hardware does not use a Tray/Locker |
| 3.4.5.1 / ST-ER-009 | Fracture-Critical Threaded Fasteners | N/A | I | COC | L-4.5 | Stowed hardware does not use Fracture-Critical Threaded Fasteners |
| 3.6.3 / HF-ER-035 | Sharp Edges and Corners | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.2 |
| 3.6.3.1 / HF-ER-035 | Protective Covers / Shields | Deleted | I | COC | L-4.5 | |
| 3.6.3.2 / HF-ER-035 | Holes | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.3 N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have holes |
| 3.6.3.3 / HF-ER-035 | Screws / Bolts End | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.5 N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have screws/bolts |
| 3.6.3.4 / HF-ER-035 | Burrs | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.8 |

TABLE 4.2-5 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR CIR PRE-POSITIONED MIDDECK TRANSPORT (I.E. MIDDECK PASSIVE STOWED) ¹ (6 PAGES)

| 52000 IDD Number / VRDS Cross-Reference | IDD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date | Comments |
|---|--|-----------------------|---------------------|---|-------------------------|--|
| 3.6.3.5 / HF-ER-035 | Latches | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.4 N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have latches. |
| 3.6.3.6 / HF-ER-035 | Levers, Cranks, Hooks, and Controls | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.7 N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have levers, cranks, hooks, and controls. |
| 3.6.3.7 / HF-ER-035 | Safety/Lockwire | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.9 N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not use safety/lockwire |
| 3.6.3.8 / HF-ER-035 | Securing Pins | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.9.6 N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have securing pins. |
| 3.8 / HF-ER-034 | IVA Transfer Pathway | A | I | COC | L-9 | |
| 3.9 / ME-MD-003 | Orbiter Overhead Window Interface | N/A | I | COC | L-4.5 | No interface to the overhead window |
| 4.1.1.2 / ST-ER-004 | Middeck Payload Frequency Compatibility | N/A | A or A & T | COC | L-4.5 | Payload equipment is not hard mounted during launch |
| 4.1.2.2 / ST-ER-001 | Middeck Low Frequency Launch and Landing Loads | A | A or A & T | Data Certification with summary of margins of safety and analysis | L-12 | Covered by reference of the Soft-Stow Memo |

TABLE 4.2-5 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR CIR PRE-POSITIONED MIDDECK TRANSPORT (I.E. MIDDECK PASSIVE STOWED) ¹ (6 PAGES)

| 52000 IDD Number / VRDS Cross-Reference | IDD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date | Comments |
|---|--|-----------------------|---------------------|--|-------------------------|--|
| | | | | load factors for all SCS as identified in accordance with 52005. | | ES2-02-049, except that verification of the MDCA Fuel Reservoir Sub-Assy (Part number: 67235MFAC13500) is not covered by the soft-stow memo. |
| 4.1.2.4 / ST-ER-001 | Middeck Low Frequency On-Orbit Loads | N/A | A or A & T | Data Certification with summary of margins of safety and analysis load factors for all SCS as identified in accordance with 52005. | L-12 | Hardware remains stowed while in Middeck. |
| 4.1.3.2 / ST-ER-001 | Middeck Factors of Safety | A | A or A & T | 1. COC 2. COC | 1. L-12 2. L-4.5 | |
| 4.2.1 / ST-ER-001 | Middeck Emergency Landing Load Factors | N/A, A ⁴ | T & A | Data Certification with summary of margins of safety and analysis load factors for all SCS as identified in accordance with 52005. | L-12 | Non safety critical hardware is contained and will not create a hazard. |
| 4.3.2 / ST-ER-001 | Middeck Random Vibration Loads | N/A | A or A & T | Data Certification with summary of margins of safety and analysis load factors for all SCS as identified in accordance with 52005. | L-12 | Hardware is soft-stowed |
| 4.4.1 / ST-ER-011 | Single MDL Location Mass Properties Limits | N/A | A & T | Certified weight and balance report for each payload element and mass properties compliance assessment. | L-12 | Hardware is not stowed in a locker |
| 4.4.2 / ST-ER-011 | Double MDL Location Mass Properties Limits | N/A | A & T | Certified weight and balance report for each payload element | L-12 | Hardware is not stowed in a locker |

TABLE 4.2-5 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR CIR PRE-POSITIONED MIDDECK TRANSPORT (I.E. MIDDECK PASSIVE STOWED) ¹ (6 PAGES)

| 52000 IDD Number / VRDS Cross-Reference | IDD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date | Comments |
|---|---|-----------------------|---------------------|---|-------------------------|--|
| | | | | and mass properties compliance assessment. | | |
| 4.5.1 / ST-ER-002 | Crew-Induced Loading | A | A | Data Certification providing a summary listing of all operational modes analyzed and a summary of the margins of safety | L-12 | Covered by verification of SSP 57000 requirement 3.1.1.3.D |
| 4.6.2 / ST-ER-008 | Fracture Control | A | A & I | Data Certification providing a fracture control summary report (submitted to the PSRP during the Phase 3 Flight Safety Review). | L-11.5 | |
| 4.7.1 / ST-ER-001 | Lift-Off and Ascent Acoustic | A | A or A & T | COC | L-3.5 | N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Does not have a low mass density and large surface area. |
| 4.8.3A / ST-ER-003 | Middeck Maximum Depressurization / Repressurization Rates | A | A or A & T | COC | L-4.5 | |
| 4.8.3B / ST-ER-003 | Middeck Maximum Depressurization / Repressurization Rates | A | A &/or T | COC | L-4.5 | |
| 5.2 / TH-ER-005 | ISS Laboratory (Cabin) Environmental Conditions | A | A &/or T | COC (See Note 2) | L-4.5 | |
| 7.2.2.D / EL-MD-004 | Lightning | A ³ | A | Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1. | L-7.5 | N/A for ULF-5 MDCA Needle Kit Return items ⁵ as they are encompassed by TIA 958C, Scenario #1: No electrical Hardware; contains no electrical circuits and is soft stowed in insulating |

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TABLE 4.2-5 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR CIR PRE-POSITIONED MIDDECK TRANSPORT (I.E. MIDDECK PASSIVE STOWED) ¹ (6 PAGES)

| 52000 IDD Number / VRDS Cross-Reference | IDD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date | Comments |
|---|--|-----------------------|---------------------|-----------------------------|-------------------------|---|
| | | | | | | packaging and contains no explosives or highly flammable material. |
| 10.1.A / MP-ER-001 | Payload Equipment Surface Cleanliness | A | A & T & I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.11.3 |
| 10.1.B / MP-ER-001 | Payload Equipment Surface Cleanliness | A | A & T & I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.11.3 |
| 10.2.2 / EN-ER-001 | Supplemental Lighting | N/A | A | COC | L-4.5 | Payload has no Lighting requirements |
| 10.5.2A / EN-ER-004 | Chemical Releases | A | A | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.9.2.3 N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have chemicals. |
| 10.5.2B / EN-ER-004 | Chemical Releases | A | A | COC | L-4.5 | N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have volatile organics. |
| 10.5.2C / EN-ER-004 | Chemical Releases | A | A | COC | L-4.5 | N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have chemicals. |
| 10.5.2D / EN-ER-004 | Chemical Releases | A | A | COC | L-4.5 | N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have chemicals. |
| 12.5 / HF-ER-039 | Identification Labeling | A | I | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.7 |
| 12.7.4A / HF-ER-024 | Arrangement and Orientation for Connectors | A | I & D | COC | L-4.5 | Covered by verification of SSP 57000 requirement |

TABLE 4.2-5 SSP 52000 APPLICABILITY / VERIFICATION MATRIX FOR CIR PRE-POSITIONED MIDDECK TRANSPORT (I.E. MIDDECK PASSIVE STOWED) ¹ (6 PAGES)

| 52000 IDD Number / VRDS Cross-Reference | IDD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date | Comments |
|---|--|-----------------------|---------------------|-----------------------------|-------------------------|--|
| | | | | | | 3.12.4.3.6.A N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have connectors |
| 12.7.4B / HF-ER-024 | Arrangement and Orientation for Connectors | A | I & D | COC | L-4.5 | Covered by verification of SSP 57000 requirement 3.12.4.3.6.B N/A for ULF-5 MDCA Needle Kit Return items ⁵ - Do not have connectors |

Note 1: The Requirements in Table 4.2-5 apply to all hardware groupings (1-5) in Table 4.2-2.

Note 2: The maximum temperature range identified for Shuttle Middeck structure is 48.9°C per SSP 52000-IDD-ERP Table 5.1.2.1-1. The maximum temperature range identified for ISS modules is 46°C per SSP 57000 Requirement 3.9.1.2.

Note 3: This requirement is applicable to CIR LLL-UV Imaging Package, part number: 67212MFAN14000.

Note 4: The requirement is applicable to the MDCA Fuel Reservoir Sub-Assy (Part number: 67235MFAC13500).

Note 5: The ULF-5 MDCA Needle Kit Return items include: Replaceable Fuel System 1 Stowage Case Assembly, P/N: 67235MFAL21006; Replaceable Fuel System Subassembly 1, P/N: 67235MFAC13310; Replaceable Fuel System 2 Stowage Case Assembly, P/N: 67235MFAL21001; and Replaceable Fuel System Subassembly 2, P/N: 67235MFAC13300.

Table 4.2-6 is applicable to the parts listed in Table 4.4-3, FCF/CIR/MDCA Kits.

**TABLE 4.2-6 SSP 57000 APPLICABILITY / VERIFICATION MATRIX
FOR MPLM-TRANSPORTED PAYLOADS (3 PAGES)**

| IRD Number | IRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date L-X mos | Comments |
|---|---------------------------------|-----------------------|---------------------|---|---------------------------------|---|
| 3. 1. 1. 2. B / 4. 3. 1. 1. 2. B | MPLM Interfaces | A | A | Certificate of Compliance. | L-3.5 | |
| 3. 1. 1. 2. 1 / 4. 3. 1. 1. 2. 1 | MPLM Late Access Requirements | N/A | T | Certificate of Compliance. | L-3.5 | No Late Access |
| 3. 1. 1. 2. 1. 1. A / 4. 3. 1. 1. 2. 1. 1. A | MPLM Late Access Envelope (KSC) | N/A | I | Certificate of Compliance. | L-3.5 | No Late Access |
| 3. 1. 1. 2. 1. 1. B / 4. 3. 1. 1. 2. 1. 1. B | MPLM Late Access Envelope (KSC) | N/A | I | Certificate of Compliance. | L-3.5 | No Late Access |
| 3. 1. 1. 2. 1. 1. C / 4. 3. 1. 1. 2. 1. 1. C | MPLM Late Access Envelope (KSC) | N/A | I | Certificate of Compliance. | L-3.5 | No Late Access |
| 3. 1. 1. 3. A / 4. 3. 1. 1. 3. A | Loads Requirements | N/A | A (Note 1) | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1. L-7.5 2. L-5 | Equipment is launched outside of the rack and soft-stowed |
| 3. 1. 1. 3. D / 4. 3. 1. 1. 3. D | Loads Requirements | A | A | Data Cert providing a summary listing as defined in SSP 57000, Table 3.1.1.3-1 showing positive margins of safety | L-7.5 | |

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**TABLE 4.2-6 SSP 57000 APPLICABILITY / VERIFICATION MATRIX
FOR MPLM-TRANSPORTED PAYLOADS (3 PAGES)**

| IRD Number | IRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date L-X mos | Comments |
|-------------------------------------|------------------------------|-----------------------|---------------------|---|---------------------------------|--|
| 3. 1. 1. 3. F / 4. 3. 1. 1. 3. F | Loads Requirements | A | A | 1. Data Cert providing a summary of the margins of safety using design loads if DLA results are not available. 2. Data Cert providing a summary of the margins of safety using loads validated by the Verification Loads Analysis. | 1. L-7.5 2. L-5 | Closed by reference of soft-stow memo ES2-02-049 |
| 3. 2. 4. 4 / 4. 3. 2. 4. 4 | Electromagnetic Interference | A | T&A | 1. Test Report 2. Analysis report for the integrated rack based on sub-rack and/or rack equipment test data. | 1. L-7.5 2. L-7.5 | RE02 only Closed by integrated rack verification data |
| 3. 2. 4. 9 / 4. 3. 2. 4. 9 | Lightning | A | A | Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1. | L-7.5 | TIA #958c |
| 3. 7. 5 / 4. 3. 7. 5 | Pressurized Gas Systems | A | A | Data Cert providing maximum credible leak rate (in slpm) for each bottle. | L-7.5 | |
| 3. 9. 1. 1 / 4. 3. 9. 1. 1 | Pressure | A | Safety (Note 2) | Certificate of Compliance. | L-3.5 | |
| 3. 9. 1. 2 / 4. 3. 9. 1. 2 | Temperature | A | Safety (Note 2) | Certificate of Compliance. | L-3.5 | |
| 3. 9. 1. 3 / 4. 3. 9. 1. 3 | Humidity | A | A | Analysis report including: – Description of condensation collection system. – Illustration of all components or surfaces where condensation is most likely to occur. – Upper humidity limit in terms of dewpoint. | L-7.5 | November 2010 |

**TABLE 4.2-6 SSP 57000 APPLICABILITY / VERIFICATION MATRIX
FOR MPLM-TRANSPORTED PAYLOADS (3 PAGES)**

| IRD Number | IRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date L-X mos | Comments |
|----------------------------|---|-----------------------|---------------------|--|---------------------------------|---|
| | | | | – All rack surface temperature | | |
| 3.9.2.3.A / 4.3.9.2.3.A | Chemical Releases | A | Safety (Note 2) | Certificate of Compliance. | L-3.5 | Closed by integrated rack verification data |
| 3.9.2.3.B / 4.3.9.2.3.B | Chemical Releases | A | A | Certificate of Compliance. | L-3.5 | Closed by integrated rack verification data |
| 3.9.3.1 / 4.3.9.3.1 | Integrated Rack Contained or Generated Ionizing Radiation | A | Safety (Note 2) | Certificate of Compliance. | L-3.5 | Closed by integrated rack verification data |
| 3.9.3.3 / 4.3.9.3.3 | Single Event Effect (SEE) Ionizing Radiation | A | A | Certificate of Compliance. | L-3.5 | Closed by integrated rack verification data |
| 3.11.1 / 4.3.11.1 | Materials and Parts Use and Selection | A | Safety (Note 2) | Certificate of Compliance. | L-3.5 | |
| 3.11.3 / 4.3.11.3 | Cleanliness | A | I | Certificate of Compliance. (Note 3) | L-3.5 | |
| 3.12.1.A / 4.3.12.1.A | Strength Requirements | A | A or D | Certificate of Compliance. (Note 3) | L-3.5 | Closed by integrated rack verification data |
| 3.12.9.2 / 4.3.12.9.2 | Sharp Edges and Corners Protection | A | Safety (Note 2) | Certificate of Compliance. (Note 3) | L-3.5 | |
| 3.12.9.8 / 4.3.12.9.8 | Burrs | A | I | Certificate of Compliance. (Note 3) | L-3.5 | |

Note 1: Integrated racks with on-orbit configuration changes will require re-verification by the rack integrator for MPLM descent.

Note 2: Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report to the PSRP.

Note 3: Requirement may be closed by submittal of pre-launch verification

Note 4: The requirements in this applicability matrix are based on Revision H of SSP 57000 and Revision A of SSP 57008.

TABLE 4.2-7 HTV APPLICABILITY/VERIFICATION MATRIX (2 PAGES)

| Requirement Paragraph | HTV Requirement | Payload Applicability | Verification Method | Required Submittal Data | Submittal Date (L-X mos) | Comments |
|-----------------------|---|-----------------------|---------------------|--|--------------------------|---|
| N.3.0 | Requirements | | NVR | | | |
| N.3.1 | General | | NVR | | | |
| N.3.1.1 | Definition of Soft-stowed Cargo | | NVR | | | |
| N.3.1.2 | Coordinate System | | NVR | | | |
| N.3.2 | Interface Requirements | | NVR | | | |
| N.3.2.1 | Soft-Stowed Payload Envelope Requirements | A | I | CoC | L-6.5 | |
| N.3.2.2 | Soft-Stowed Payload Mass Properties | A | T | CoC | L-6.5 | |
| N.3.2.3 | Structural and Mechanical | | NVR | | | |
| N.3.2.4 | Induced Environments | | NVR | | | |
| N.3.2.4.1 | Vibro-acoustic | | NVR | | | |
| N.3.2.4.1.1 | Launch Acoustics | | NVR | | | |
| N.3.2.4.1.2 | Random Vibration for Soft-Stowed Payloads | A | A | Data Cert providing a summary of the margins of safety using design loads. | L-7.5 | |
| N.3.2.4.2 | Sinusoidal Vibration | | NVR | | | |
| N.3.2.4.3 | Shock | | NVR | | | |
| N.3.2.4.4 | Acceleration | A | A | Data Cert providing a summary of the margins of safety using design loads. | L-7.5 | |
| N.3.2.4.5 | Thermal Environments | A | A | CoC | L-6.5 | |
| N.3.2.4.6 | Interface Loads | | NVR | | | |
| N.3.2.4.7 | Load Spectrum | | NVR | | | |
| N.3.2.4.7.1 | H-IIB Launch load spectrum for HTV | | NVR | | | |
| N.3.2.4.7.2 | On-orbit load spectrum | | NVR | | | |
| N.3.2.4.8 | Pressure Environments | A | A | CoC | L-6.5 | Equivalent requirement for Depress/Repressurization: SSP 52000 Requirement 4.8.3.A or SSP 57000 Requirement 3.1.1.2.B and 3.1.1.4.B |

TABLE 4.2-7 HTV APPLICABILITY/VERIFICATION MATRIX (2 PAGES)

| Requirement Paragraph | HTV Requirement | Payload Applicability | Verification Method | Required Submittal Data | Submittal Date (L-X mos) | Comments |
|-----------------------|---|-----------------------|---------------------|---|--------------------------|--|
| N.3.2.4.9 | Humidity | A | A | CoC | L-6.5 | |
| N.3.2.5 | Cargo Service | A | A | CoC | L-6.5 | |
| N.3.2.6. | Late Access | | NVR | | | |
| N.3.2.6.1 | Late Access Dimensions | N/A | T | CoC | L-6.5 | No Late Access |
| N.3.2.6.2 | Late Access Mass Limits | N/A | T | CoC | L-6.5 | No Late Access |
| N.3.2.7 | Safety Requirements | A | Safety ¹ | CoC | L-6.5 | |
| N.3.2.8 | Electrical Interface | | NVR | | | |
| N.3.2.9 | Thermal Interface | | NVR | | | |
| N.3.2.10 | Restraints and Mobility Aids Hardware Interface | | NVR | | | |
| N.3.2.11 | Criteria of Fluid Leak | | NVR | | | |
| N.3.2.11.1 | Fluid Leak Failure Tolerance | E | I | CoC | L-6.5 | See Note 2 57217-NA-0059 |
| N.3.2.11.2 | Fluid Leak Rate | A | A or I | Data Cert providing maximum credible leak rate (in SLPM) | L-7.5 | See Note 2 |
| N.3.2.11.3 | Total Fluid Leak | A | A | Data Cert providing the maximum total gross weight of fluid | L-7.5 | See Note 2 |
| N.3.2.12 | Off Gassing | A | T and A | CoC | L-6.5 | Equivalent requirement: SSP 52000 Requirement 13.1.4 |
| N.3.2.13 | Materials and Processes | | NVR | | | |
| N.3.2.13.1 | Materials and Processes Approval | A | I | CoC | L-6.5 | Equivalent requirement: SSP52000 Requirement 13.1, or 57000 Requirement 3.11.1 |
| N.3.2.13.2 | Control of water soluble Volatile Organic Compounds | N/A | A | CoC | L-6.5 | No volatile organic compounds |
| N.3.2.14 | Cleanliness | A | I | CoC | L-6.5 | |

Notes:

1) Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report to the PSRP.

2) Requirement is applicable to CIR High Percentage Oxygen Bottle (PN: 67212MFAM70005); CIR Manifold #2 Bottle 2.25 L (PN: 67212MFAM70009); CIR Manifold #1 Bottle 2.25 L (PN: 67212MFAM70101); MDCA Fuel Reservoir (PN: 67235MFAC13500). This requirement is not applicable to the other items because they do not contain fluids.

TABLE 4.2-8 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B (PLUS PIRN 57008-NA-0022B) REQUIREMENTS, APPENDIX P (6 PAGES)

| CIRD Requirement Paragraph (SSP 50835) | CIRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date (L-X mos) | Comments |
|---|---|-----------------------|---------------------|---|-----------------------------------|--|
| 3. 1. 1 / 4. 3. 1. 1 | Structures/ Mechanisms | A | T ² | Test Report | L-7.5 | Text Substitution #1.Equivalent to SSP 57000, 3.1.1.5. |
| 3. 1. 1. 2. 1. 1. 1. A / 4. 3. 1. 1. 2. 1. 1. 1. A | Acceleration Force Loads for Pre-Defined End Item Orientation | N/A | A | CoC | L-6.5 | No specific orientation required |
| 3. 1. 1. 2. 1. 1. 1. B / 4. 3. 1. 1. 2. 1. 1. 1. B | Acceleration Force Loads for Pre-Defined End Item Orientation | N/A | A | Data Cert providing a summary of the margins of safety using design loads | L-7.5 | No specific orientation required |
| 3. 1. 1. 2. 1. 1. 2. A / 4. 3. 1. 1. 2. 1. 1. 2. A | Acceleration Force Loads for Undefined End Item Orientation | A | A | CoC | L-6.5 | Text Substitution #2 |
| 3. 1. 1. 2. 1. 1. 2. B / 4. 3. 1. 1. 2. 1. 1. 2. B | Acceleration Force Loads for Undefined End Item Orientation | A | A | Data Cert providing a summary of the margins of safety using design loads | L-7.5 | Text Substitution #2 |
| 3. 1. 1. 2. 1. 2. 3 / 4. 3. 1. 1. 2. 1. 2. 3 | Random Vibration Requirements for foam packed end items | A | T ² | Test Report | L-7.5 | Text Substitution #3 |
| 3. 1. 1. 2. 1. 3 / 4. 3. 1. 1. 2. 1. 3 | Acoustic Environments | A | A or T | Test Report | L-7.5 | Text Substitution #3 |
| 3. 1. 1. 2. 1. 4. 3 / 4. 3. 1. 1. 2. 1. 4. 3 | Shock Environments for Foam Packed Items | A | T ² | Test Report | L-7.5 | Text Substitution #3 |
| 3. 1. 1. 2. 1. 5. B / 4. 3. 1. 1. 2. 1. 5. B | Pressure Loading | A | A | CoC | L-6.5 | Text Substitution #2 |
| 3. 1. 1. 2. 2. 4. C / 4. 3. 1. 1. 2. 2. 4. C | European ATV | A | T ² | Test Report | L-7.5 | Text Substitution #4 |

TABLE 4.2-8 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B (PLUS PIRN 57008-NA-0022B) REQUIREMENTS, APPENDIX P (6 PAGES)

| CIRD Requirement Paragraph (SSP 50835) | CIRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date (L-X mos) | Comments |
|--|---------------------------|-----------------------|---------------------|--|-----------------------------------|--|
| 3. 1. 1. 2. 2. 5. B/ 4. 3. 1. 1. 2. 2. 5. B | Japanese HTV | N/A | A | Fatigue Analysis Report showing the integrated end item will retain sufficient life after being subjected to the HTV launch load spectrum. | L-7.5 | Not a fracture critical payload |
| 3. 1. 1. 3. A/ 4. 3. 1. 1. 3. A | On-Orbit Environments | A | A | Data Cert providing a margin of safety summary in accordance with SSP 52005. | L-7.5 | Equivalent to SSP 57000 3.1.1.3.B and 52000 4.5.2. |
| 3. 1. 1. 3. B/ 4. 3. 1. 1. 3. B | On-Orbit Environments | A | A | Data Cert providing a summary of the positive margins of safety | L-7.5 | |
| 3. 1. 1. 3. C/ 4. 3. 1. 1. 3. C | On-Orbit Environments | A | A | Data Cert providing a summary of the positive margins of safety | L-7.5 | |
| 3. 1. 1. 3. D/ 4. 3. 1. 1. 3. D | On-Orbit Environments | A | A | Data Cert providing a summary of the positive margins of safety | L-7.5 | |
| 3. 1. 1. 3. E/ 4. 3. 1. 1. 3. E | On-Orbit Environments | A | A | Data Cert providing a summary listing as defined in SSP 57000, Table 3.1.1.3-1, showing positive margins of safety. | L-7.5 | Equivalent to SSP 57000 3.1.1.3.D and 52000 4.5.1 |
| 3. 1. 4. 1. 1/ 4. 3. 1. 4. 1. 1 | MPLM Late Access Weight | N/A | T | CoC | L-6.5 | No Late Access |
| 3. 1. 4. 1. 2. A/ 4. 3. 1. 4. 1. 2. A | MPLM Late Access Envelope | N/A | I | CoC | L-6.5 | No Late Access |
| 3. 1. 4. 1. 2. B/ 4. 3. 1. 4. 1. 2. B | MPLM Late Access Envelope | N/A | I | CoC | L-6.5 | No Late Access |
| 3. 1. 4. 1. 2. C/ 4. 3. 1. 4. 1. 2. C | MPLM Late Access Envelope | N/A | I | CoC | L-6.5 | No Late Access |

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TABLE 4.2-8 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B (PLUS PIRN 57008-NA-0022B) REQUIREMENTS, APPENDIX P (6 PAGES)

| CIRD Requirement Paragraph (SSP 50835) | CIRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date (L-X mos) | Comments |
|--|--|-----------------------|---------------------|---|-----------------------------------|--|
| 3. 1. 4. 5/ 4. 3. 1. 4. 5 | H-IIB Transfer Vehicle | N/A | D | CoC | L-6.5 | No Late Access |
| 3. 2. 4. 5/ 4. 3. 2. 4. 5 | Electrostatic Discharge | A | T or A&I | 1. A report on test results or an analysis showing compliance during functional testing. 2. Certificate of Compliance (COC) showing that the inspection identifies labeling. | L-7.5 L-7.5 | Equivalent to SSP 57000 3.2.4.5. |
| 3. 2. 4. 7. 2/ 4. 3. 2. 4. 7. 2 | DC Magnetic Fields for Russian Launch Vehicles | N/A | T | Test Report | L-7.5 | Not powered during launch and also does not contain magnets. |
| 3. 2. 4. 9/ 4. 3. 2. 4. 9 | Lightning | A | A | Analysis showing compliance with the requirements of SSP 30243, par. 3.2.8.1. | L-7.5 | Note: For closure rationale see Electromagnetic Effects (EME) Panel TIA #958c Equivalent to SSP 57000 3.2.4.9. |
| 3. 2. 9. A/ 4. 3. 2. 9. A | Batteries | N/A | Safety ¹ | CoC | L-6.5 | No batteries |
| 3. 7. 6/ 4. 3. 7. 6 | Pressurized Gas Systems | A | A | Data Cert providing maximum credible leak rate (in slpm) for each bottle. | L-7.5 | |
| 3. 9. 1. 1. A/ 4. 3. 9. 1. 1. A | Pressure | A | A | CoC | L-6.5 | Text Substitution #2 and Text Substitution #5 |
| 3. 9. 1. 2. B/ 4. 3. 9. 1. 2. B | Temperature | A | Safety ¹ | CoC | L-6.5 | |
| 3. 9. 1. 2. D/ 4. 3. 9. 1. 2. D | Temperature | A | Safety ¹ | CoC | L-6.5 | |
| 3. 9. 1. 3. A/ 4. 3. 9. 1. 3. A | Humidity | A | A | CoC | L-6.5 | Text Substitution #2 and Text Substitution #5 |

TABLE 4.2-8 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B (PLUS PIRN 57008-NA-0022B) REQUIREMENTS, APPENDIX P (6 PAGES)

| CIRD Requirement Paragraph (SSP 50835) | CIRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date (L-X mos) | Comments |
|--|---|-----------------------|---------------------|--|-----------------------------------|--|
| 3.9.1.3.D/ 4.3.9.1.3.D | Humidity | A | A | CoC | L-6.5 | |
| 3.9.2.3.A/ 4.3.9.2.3.A | Chemical Releases | A | Safety ¹ | CoC | L-6.5 | Text Substitution #6 Equivalent to SSP 57000 3.9.2.3.A and 52000 10.5.2.A with the substitution. |
| 3.9.2.3.B/ 4.3.9.2.3.B | Chemical Releases | A | A | CoC | L-6.5 | Equivalent to SSP 57000 3.9.2.3.B and 52000 10.5.2.B |
| 3.9.3.2/ 4.3.9.3.2 | Ionizing Radiation Dose | A | A | CoC | L-6.5 | Text Substitution #7 Equivalent to SSP 57000 3.9.3.2 |
| 3.10.5.A/ 4.3.10.5.A | Labeling | N/A | I | CoC | L-6.5 | No PFE Access Port |
| 3.10.5.B/ 4.3.10.5.B | Labeling | N/A | I | Drawing and a COC showing the size and location of the fire detection indicator. | L-7.5 | No Fire Detection LED |
| 3.11.1/ 4.3.11.1 | Materials and Processes Use and Selection | A | I | CoC | L-6.5 | Equivalent to SSP 57000 3.11.1 and to a combination of the following 52000 requirements: 13.1, 13.1.2, 13.1.3, 13.1.4 and 14.1.1 |
| 3.11.3/ 4.3.11.3 | Cleanliness | A | I | CoC | L-6.5 | Equivalent to 57000 3.11.3 and to 52000 10.1.B |
| 3.12.1.A / 4.3.12.1.A | Strength Requirements | A | A or D | CoC | L-6.5 | Equivalent to SSP 57000 3.12.1.A |

TABLE 4.2-8 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B (PLUS PIRN 57008-NA-0022B) REQUIREMENTS, APPENDIX P (6 PAGES)

| CIRD Requirement Paragraph (SSP 50835) | CIRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date (L-X mos) | Comments |
|---|--|-----------------------|---------------------|-----------------------------|-----------------------------------|--|
| 3.12. 3. 1. 3 / 4. 3.12. 3. 1. 3 | One-Handed Operation | A | D | CoC | L-6.5 | Equivalent to SSP 57000 3.12.3.1.5 |
| 3.12. 3. 2. 1. A / 4. 3.12. 3. 2. 1. A | Continuous/Incidental Contact - High Temperature | N/A | Safety ¹ | CoC | L-6.5 | No heating source |
| 3.12. 3. 2. 2. A / 4. 3.12. 3. 2. 2. A | Continuous/Incidental Contact - Low Temperature | N/A | Safety ¹ | CoC | L-6.5 | No cooling source |
| 3.12. 4. 3. 8 / 4. 3.12. 4. 3. 8 | Connector Protection | A | A | CoC | L-6.5 | Equivalent to SSP 57000 3.12.4.3.8 |
| 3.12. 6. 3 / 4. 3.12. 6. 3 | Captive Parts | A | I | CoC | L-6.5 | Equivalent to SSP 57000 3.12.6.3 |
| 3.12. 6. 4. 1 / 4. 3.12. 6. 4. 1 | Handles and Restraints | N/A | I or D | CoC | L-6.5 | Items less than 1 cubic foot |
| 3.12. 6. 4. 3 / 4. 3.12. 6. 4. 3 | Handle Location/Front Access | N/A | I | CoC | L-6.5 | Items less than 1 cubic foot |
| 3.12. 6. 4. 4 / 4. 3.12. 6. 4. 4 | Handle Dimensions | N/A | A or D | CoC | L-6.5 | Items less than 1 cubic foot |
| 3.12. 6. 4. 5. A / 4. 3.12. 6. 4. 5. A | Non-Fixed Handles Design Requirements | N/A | A&D | CoC | L-6.5 | Items less than 1 cubic foot |
| 3.12. 6. 4. 5. B / 4. 3.12. 6. 4. 5. B | Non-Fixed Handles Design Requirements | N/A | D | CoC | L-6.5 | Items less than 1 cubic foot |
| 3.12. 6. 4. 5. C / 4. 3.12. 6. 4. 5. C | Non-Fixed Handles Design Requirements | N/A | I&D | CoC | L-6.5 | Items less than 1 cubic foot |
| 3.12. 9. 2 / 4. 3.12. 9. 2 | Sharp Edges and Corners Protection | A | Safety ¹ | CoC | L-6.5 | Text Substitution #6. Equivalent to SSP 57000 3.12.9.2 and 52000 3.6.3 |
| 3.12. 9. 8 / 4. 3.12. 9. 8 | Burrs | A | I | CoC | L-6.5 | Equivalent to SSP 57000 3.12.9.8 and 52000 3.6.3.4 |
| 3.12. 9. 9. A / 4. 3.12. 9. 9. A | Locking Wires | N/A | A | CoC | L-6.5 | No locking wires |
| 3.12. 9. 9. B / 4. 3.12. 9. 9. B | Locking Wires | N/A | I | CoC | L-6.5 | No locking wires |

TABLE 4.2-8 APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B (PLUS PIRN 57008-NA-0022B) REQUIREMENTS, APPENDIX P (6 PAGES)

| CIRD Requirement Paragraph (SSP 50835) | CIRD Requirement | Payload Applicability | Verification Method | Verification Data Submittal | Required Submittal Date (L-X mos) | Comments |
|--|------------------|-----------------------|---------------------|-----------------------------|-----------------------------------|----------|
|--|------------------|-----------------------|---------------------|-----------------------------|-----------------------------------|----------|

Note: The requirements in this matrix are written per SSP 50835, Revision A.

Note 1: Verification of compliance with this requirement is closed via approval of the corresponding payload hazard report by the PSRP.

Note 2: This verification may be considered successful when the payload developer submits a Certificate of Compliance stating the hardware has no safety-critical components (as defined in SSP 52005) and the payload developer accepts the risk to mission success of not performing the test.

Key: Payload Applicability, A = Applicable, E = Exception, N/A = Not Applicable, NAR = Not a Requirement, A-N = Applicable with Note, NVR = No Verification Required.

Key: Verification Method, A = Analysis, D = Demonstration, I = Inspection, T = Test, NVR = No Verification Required, N/A = Not Applicable

Text Substitution Notes:

| | For the following wording in SSP 50835: | Payloads substitute or add this wording: |
|----|--|--|
| 1. | SSP 30558 and SSP 30559 | SSP 52005 |
| 2. | VCB | PECP |
| 3. | shall meet the specified performance requirements | shall maintain positive margins of safety |
| 4. | shall meet the specified performance requirements | shall remain contained and not create a hazard |
| 5. | shall operate properly | shall remain safe |
| 6. | SSP 50021 | NSTS 1700.7B/ISS |
| 7. | shall meet the performance requirements specified herein | shall remain safe |

4.3 EXPERIMENT UNIQUE EQUIPMENT

Payloads that have Experiment Unique Equipment (EUE) not addressed in Table 4.2-1 must address the EUE interface and verification requirements in Table 4.3-1, Combustion Integrated Rack Experiment Unique Equipment Applicability/Verification Matrix, as required for each additional item. Table 4.3-1 will include only those IRD requirements that are applicable to the EUE.

TABLE 4.3-1 COMBUSTION INTEGRATED RACK EXPERIMENT UNIQUE EQUIPMENT APPLICABILITY/VERIFICATION MATRIX

| IRD Paragraph | IRD Requirement | {Payload} EUE Applicability | Method | Required Submittal Data | Submittal Date | Comments |
|---------------|-----------------|-----------------------------------|--------|-------------------------------|-------------------|----------|
| N/A | | | | | | |

4.4 CIR CONFIGURATION LIST

The following tables contain subcomponents of the CIR which have been verified for launch, shown by the designated carrier, and operation aboard the US Lab based on requirements in Table 4.2-1, and within the verification submissions for the CIR Rack part numbers listed in Table 4.4-1, FCF/CIR Outfitting Hardware & ORUs, Table 4.4-2, MDCA Hardware & ORU's, Table 4.4-3, FCF/CIR/MDCA Kits, Table 4.4-4, Boeing provided PaRIS Hardware, and Table 4.4-5, Post CIR Launch – Middeck Items. Hardware flying on a carrier not listed under carrier compatibility will verify transport requirements according to the Common Transport Matrix in Table 4.2-8. The items contained in Table 4.4-5 utilize the middeck requirements in Table 4.2-5 for transport.

- ATV requirements (ATV) are shown in table 4.2-4.
- Middeck requirements (MDK) are shown in table 4.2-5.
- MPLM/PMM requirements (MPLM) are shown in table 4.2-6.
- HTV requirements (HTV) are shown in table 4.2-7.
- Common launch requirements (CL) are shown in table 4.2-8.

The subcomponents listed in the tables below are integrated as part of one of the following configurations.

- 67212MFAH00005 = COMBUSTION INTEGRATED RACK, LAUNCH CONFIGURATION
- 67212MFAH00000 = COMBUSTION INTEGRATED RACK BASE ON-ORBIT CONFIGURATION
- 67212MFAH00006 = CIR/MDCA ON-ORBIT CONFIGURATION

TABLE 4.4-1 FCF/CIR OUTFITTING HARDWARE & ORUS (2 PAGES)

| PART NAME | PART NUMBER | CARRIER COMPATIBILITY |
|--|--------------------|------------------------------|
| CIR GN2 Hose | 67211MFAD30005 | MPLM, MDK, ATV |
| CIR VES Hose | 67211MFAD30007 | MPLM, MDK, ATV |
| FCF I/O Processor Hard Disk Drive | 67211EFAB10831 | MPLM, MDK, HTV |
| CIR Smoke Detector | 67211MFAD40024 | MPLM |
| CIR Air Velocity Probe | 67211MFAD40001 | MPLM |
| CIR EPCU Power Cable #1 | 67212EFAH61001 | MPLM, MDK, ATV |
| CIR EPCU Power Cable #2 | 67212EFAH61002 | MPLM, MDK, ATV |
| CIR I/O Processor Air Duct | 67212MFAH20721 | MPLM, MDK, ATV |
| Gas Chromatograph | 67212MFAM30000 | CL |
| CIR FOMA Control Unit | 67212MFAM40000 | MPLM |
| FCF EPCU T-Handle | 67211MFAB60510 | MPLM, MDK, ATV |
| CIR IPSU Adapter | 67211MFAB30200 | MPLM, MDK, ATV |
| FCF IPSU-Analog | 67211MFAB31100 | MPLM, CL |
| FCF IPSU | 67211MFAB30100 | MPLM, CL |
| CIR HiBMS Imaging Package | 67212MFAN11000 | MPLM,CL |
| CIR Illumination Package | 67212MFAN13000 | MPLM, CL |
| CIR LLL-UV Imaging Package | 67212MFAN14000 | MPLM, MDK, CL |
| FCF Shared Handle | 67213MFAF15050 | MPLM, MDK, ATV |
| CIR IRR Supply Hose | 67211MFAD20064 | MPLM |
| CIR IRR Return Hose | 67211MFAD20063 | MPLM |
| CIR IPSU Power/Data Cable | 67212EFAH61006 | MPLM, ATV |
| CIR I/O Processor Custom Cable #1 | 67212EFAH61015 | MPLM |
| CIR IAM F/O Cable #1 | 67212EFAH20812-1 | MPLM, MDK, ATV |
| CIR Window Coated | 67212MFAH33013 | MPLM, MDK |
| CIR Window Uncoated | 67212MFAH33000 | MPLM, MDK |
| CIR ISM F/O Cable | 67212MFAN13010 | MPLM |
| CIR FOMA Cal Unit | 67212MFAM62000 | MPLM |
| CIR Manifold #1 Bottle 3.80 L | 67212MFAM70102 | MPLM |
| CIR Manifold #1 Bottle 2.25 L | 67212MFAM70101 | HTV, MPLM |
| CIR Manifold #2 Bottle 2.25 L | 67212MFAM70001 | MPLM, HTV |
| CIR GC Helium Bottle | 67212MFAM70400 | MPLM |
| CIR GC Argon Bottle | 67212MFAM70500 | MPLM |
| CIR GC Check Gas Bottle | 67212MFAM70600 | MPLM |
| Oxygen Manifold Gas Bottle Assembly, 3.8 L ¹ | 67212MFAM70002 | MPLM |
| Bottle Valve Cover Assembly ¹ | 67212MFAM70010 | HTV, MPLM |
| CIR High Percentage Oxygen Bottle {CIR Bottle 1.00 L (Helium)} | 67212MFAM70005 | HTV, MPLM |
| CIR Adsorber Cartridge | 67212MFAM71000 | MPLM |
| CIR Manifold #4 Bottle 1.00 L | 67212MFAM70300 | MPLM |
| CIR Fuel Supply Bypass QD | 67212MFAM00037 | MPLM |
| SAMS Head (TSH-ES) | 60005MA50000 | MPLM |
| FCF DCM | 67211MFAB20000 | MPLM, CL |
| FCF Liquid Crystal Tunable DCM | 67211MFAB20500 | CL |
| FCF Common IAM | 67211MFAB40000 | MPLM |
| CIR Liquid Crystal Tunable Filter Module | 67212MFAN40000 | MPLM, CL |
| Express Rack Laptop Ethernet | 683-44252-1 | MPLM |

TABLE 4.4-1 FCF/CIR OUTFITTING HARDWARE & ORUS (2 PAGES)

| PART NAME | PART NUMBER | CARRIER COMPATIBILITY |
|---|--------------------|------------------------------|
| Cable | | |
| Express Rack Laptop Video Cable | 683-44254-2 | MPLM |
| A31P Video Adapter | SEG3115372-301 | MPLM |
| FCF ATCU Vacuum Attachment | 67211MFAD11070 | MPLM, ATV |
| CIR Fan Lint Screen | 67211MFAD11009 | MPLM, MDK, ATV |
| CIR Door Launch Bracket Assembly, Lower Right | 67211MFAG10059 | MPLM |

Note 1: These parts are not part of the original rack configuration; therefore the rack-level verification requirements in Table 4.2-1 will be addressed for certification.

TABLE 4.4-2 MDCA HARDWARE & ORUS

| PART NAME | PART NUMBER | CARRIER COMPATIBILITY |
|-----------------------|--------------------|------------------------------|
| MDCA CIA | 67235MFAC17100 | MPLM |
| MDCA Avionics Package | 67235MEAD12000 | MPLM |
| MDCA CIA IRR Cable 1 | 67235EFAG70003 | MPLM |
| MDCA CIA IRR Cable 2 | 67235EFAG70004 | MPLM |

TABLE 4.4-3 FCF/CIR/MDCA KITS (2 PAGES)

| PART NAME | PART NUMBER | CARRIER COMPATIBILITY |
|--|-----------------------|------------------------------|
| FCF Door Plug Kit | 67211MFKG10220 | MPLM |
| FCF Door Plugs | MRDSBHCSC518-6 | MPLM |
| FCF Seal Kit | 67211MFKG10225 | MPLM |
| CIR Chamber Fan Small Seal | 67211MFAG10232 | MPLM |
| CIR Chamber Fan Large Seal | 67211MFAG10233 | MPLM |
| CIR Front End Cap Outer Seal | 67211MFAG10235 | MPLM |
| CIR Front End Cap Inner Seal | 67211MFAG10234 | MPLM |
| FCF Rack Door Short Seal | 67211MFAG10230 | MPLM |
| FCF Rack Door Long Seal | 67211MFAG10231 | MPLM |
| CIR Window Seal | 67211MFAG10238 | MPLM |
| CIR Rear End Cap Port Plug Seal | 67211MFAG10241 | MPLM |
| FIR Optics Bench Air Duct Cover | 67213MFAF20102 | MPLM |
| CIR PI Port Plug | 67211MFAG10239 | MPLM |
| CIR PI Port Plug Seal | 67211MFAG10240 | MPLM |
| FCF O-RING EXTRACTION TOOL | 67211MFAG10228 | MPLM |
| FCF RACK DOOR SEAL TOOL | 67211MFAG10227 | MPLM |
| CIR IRR Connector Cap Kit | 67212MFKH30080 | MPLM |
| CIR Package Connector Cover Kit | 67212MFKH30090 | MPLM |
| ARINC Cover Assembly | 67212MFAN00001 | MPLM, MDK, CL |
| MDCA Connector Cap Kit | 67235MFAL21060 | MPLM |
| MDCA Fiber Kit | 67235MFAL21050 | MPLM, HTV |
| MDCA Fiber Arm | 67235MFAC17146 | MPLM, HTV |
| MDCA Swab | 67235MFAL21051 | MPLM, HTV |
| MDCA Breaker Cover | 67235MFAD12013 | MPLM, HTV |

TABLE 4.4-3 FCF/CIR/MDCA KITS (2 PAGES)

| PART NAME | PART NUMBER | CARRIER COMPATIBILITY |
|---|-----------------------|------------------------------|
| MDCA Fuel Reservoir Kit | 67235MFAL21020 | MPLM |
| MDCA Fuel Reservoir | 67235MFAC13500 | MPLM, MDK, CL, HTV |
| MDCA Needle 1 Kit | 67235MFAL21040 | MPLM |
| Replaceable Fuel System 1 Stowage Case Assembly | 67235MFAL21006 | MPLM, MDK |
| MDCA Needle Cover | 67235MFAC13309 | MPLM |
| Replaceable Fuel System Subassembly 1 | 67235MFAC13310 | MPLM, MDK |
| MDCA Needle 2 & Ignitor Tip Kit | 67235MFAL21041 | MPLM |
| Replaceable Fuel System 2 Stowage Case Assembly | 67235MFAL21001 | MPLM, MDK |
| MDCA Needle Cover | 67235MFAC13309 | MPLM |
| Replaceable Fuel System Subassembly 2 | 67235MFAC13300 | MPLM, MDK |
| MDCA IGNITER TIP HOLDER | 67235MFAL21007 | MPLM |
| Ignitor Tip Assembly | 6723MFAC13709 | MPLM |
| FCF F/O Cleaning Kit | 67211MFKG10026 | MPLM |
| F/O Plug Cleaner | 67211MFAG10036 | MPLM |
| FCF F/O Jack Cleaner | 67211MFAG10037 | MPLM |
| CIR Imaging Package Kit | 67212MFKN56010 | MPLM, HTV |
| CIR 4 Tab Cover #1 | 67211MFAB42700 | MPLM |
| CIR 4 Tab Cover #2 | 67211MFAB42600 | MPLM |
| CIR 4 Tab Cover #3 | 67211MFAB42500 | MPLM, CL |
| CIR Flange Cover #1 | 67211MFAB42100 | MPLM, CL |
| FCF Lint-Free Wipe | 67211MFAG10243 | MPLM, CL |
| CIR Sensor Probe Kit | 67212MFKH00040 | MPLM |
| CIR Oxygen Sensor Probe | 67212MFAM61020 | MPLM |
| CIR Dew Point Sensor Probe | 67212EFAM60010 | MPLM |
| CIR Oxygen Sensor Probe Tool | 67212MFAH00043 | MPLM |
| CIR Krytox Kit | 67211MFKG10250 | MPLM |
| FCF Krytox | 67211MFAG10244 | MPLM |
| FCF Lint-Free Wipe | 67211MFAG10243 | MPLM |
| FCF UML Latch Handle | 67211MFAB21000 | MPLM, MDK |
| MDCA Supply Hose ³ | 67235MFAC17192 | MPLM |
| MDCA Return Hose ³ | 67235MFAC17191 | MPLM |

Note 1: Top Level Kits are indicated in **Bold**. Kit Contents are indented.

Note 2: Kit Contents will not necessarily be launched or stowed as part of the kit. Verifications for individual items are valid whether kit stowed or not.

Note 3: These parts are replacements for two hoses that were previously flown attached to the MDCA CIA (P/N 67235MFAC13500).

TABLE 4.4-4 BOEING PROVIDED PARIS HARDWARE

| PART NAME | PART NUMBER | CARRIER COMPATIBILITY |
|---|--------------------|------------------------------|
| Umbilical Assy | 1F15191-1 | MPLM, MDK, ATV |
| Umbilical Assy | 1F15192-1 | MPLM, MDK, ATV |
| Umbilical Assy | 1F15193-1 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61587-13 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61587-14 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61587-15 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61587-16 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61587-17 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61587-18 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61587-19 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61634-2 | MPLM, MDK, ATV |
| Umbilical Assembly | 683-61634-3 | MPLM |
| Umbilical Assembly | 683-61634-4 | MPLM |
| Insert Assembly - Snubber Cup (Top Right) | 1J00095-2 | MPLM, MDK, ATV |
| Insert Assembly - Snubber Cup (Top Left) | 1J00095-1 | MPLM, MDK, ATV |
| Insert Assembly - Snubber Cup (Lower Right) | 1J00095-501 | MPLM, MDK, ATV |
| Insert Assembly - Snubber Cup (Lower Left) | 1J00095-502 | MPLM, MDK, ATV |
| Snubber Assembly, Lower Left | 1J00905-1 | MPLM, MDK, ATV |
| Snubber Assembly, Lower Right | 1J00905-501 | MPLM, MDK, ATV |
| Bracket Assembly, Butterfly | 1J00908-1 | MPLM, MDK, ATV |
| Isolator Assembly, Z-Axis | 1J00950-1 | MPLM, MDK, ATV |
| Isolator Assembly, Y-Axis | 1J00951-1 | MPLM, MDK, ATV |
| Isolator Assembly, X-Axis | 1J00952-1 | MPLM, MDK, ATV |
| Isolator Assembly, Upper | 1J00953-1 | MPLM, MDK, ATV |
| RF Ground Strap | 683-61685-16 | MPLM, MDK, ATV |
| PaRIS Front Cross Beam | 1J06726-1 | MPLM |
| Pin, Center | 683-61571-30 | MPLM, MDK, ATV |
| Bridge Bracket | 683-61571-35 | MPLM, MDK, ATV |
| Bridge Bracket | 683-61571-36 | MPLM, MDK, ATV |
| Bridge Bracket FT | 683-61571-37 | MPLM, MDK, ATV |
| Bridge Bracket FT | 683-61571-38 | MPLM, MDK, ATV |
| Pushrod FTG Assembly | 683-61615-12 | MPLM, MDK, ATV |
| Upper Left Snubber Pin Mechanism Assy. | 683-61664-13 | MPLM, MDK, ATV |
| Upper Right Snubber Pin Mechanism Assy. | 683-61664-14 | MPLM, MDK, ATV |
| Upper Left Snubber Cup Mechanism Assy. | 683-61664-17 | MPLM, MDK, ATV |
| Upper Right Snubber Cup Mechanism Assy. | 683-61664-18 | MPLM, MDK, ATV |
| Lower Left Snubber Cup Mechanism Assy. | 683-61664-21 | MPLM, MDK, ATV |
| Lower Right Snubber Cup Mechanism Assy. | 683-61664-22 | MPLM, MDK, ATV |

Note: The PARIS Hardware is certified for MPLM and Middeck Launch with the ARIS PIDS (S684-10158C) and the PaRIS PIDS (S684-10585 Rev A).

TABLE 4.4-5 POST CIR LAUNCH - MIDDECK ITEMS

| PART NAME | PART NUMBER |
|---|--------------------|
| MDCA Fuel Reservoir Sub-Assy ¹ | 67235MFAC13500 |

Note 1: The MDCA Fuel Reservoir is a fuel dispensing system installed within the CIR for science operations. The Fuel Reservoir is designed to contain fuel during transport, installation and removal, while allowing precisely controlled dispensing of the desired amount of fuel for each experiment run. The Fuel Reservoir comprises an aluminum housing containing a glass syringe sealed within Tygon Tubing and housed under a transparent Lexan cover. A ground controlled valve attached to the Fuel Reservoir allows the dispensing of fuel but is designed so that it can only be actuated if properly installed within the CIR.

Fuel Reservoirs must be stowed in a clear ESD protective material. Items need to be packaged in both a bubble wrap bag and a minimum of 2.5 cm foam.

4.4.1 HTV TRANSPORT

The payload equipment listed in Table 4.4.1-1, HTV Transport Items, are launched soft-stowed in the HTV. The HTV launch requirements for these items are in Table 4.2-7, HTV Applicability/Verification Matrix. Table 4.2-1 contains the requirements for operations in the US Lab.

TABLE 4.4.1-1 HTV TRANSPORT ITEMS (2 PAGES)

| Part Name | Part Number | Description |
|--|--------------------|--|
| CIR Imaging Package Kit | 67212MFKN56010 | This kit contains components necessary to protect and cover CIR diagnostics package lenses and components during maintenance and reconfiguring. Customization will allow a broader range of science capabilities. The kit is constructed of a Nomex covered mini-cell foam containing lens cover components constructed of "Peek" (a composite material), and stainless steel d-sub connector caps. Also contains Lint Free wipes. |
| CIR High Percentage Oxygen Bottle {CIR Bottle 1.00 L (Helium)} | 67212MFAM70005 | The CIR High Percentage Oxygen Bottle is a 1 Liter / 0.26 gallon Aluminum Bottle which will be installed within the CIR. These are pressurized gas bottles. Serial Number 2002 contains 40% Oxygen and 60% Helium pressurized to 12748.4 kPa / 1849 psi at 21.1° C / 69.98° F |
| CIR Manifold #2 Bottle 2.25 L | 67212MFAM70001 | The CIR Manifold #2 Bottle 2.25 L is a 2.25 Liter / 0.59 gallon Pressurized Aluminum Bottle which will be installed within the CIR. S/N 2017 contains 40% Oxygen and 60% Helium pressurized to 12748.4 kPa / 1849 psi at 21.1° C. S/N 2018 contains 40% Oxygen, 20% Helium and 40% Nitrogen pressurized to 12748.4 KPa / 1849 psi at 21.1 ° C / 69.98° F |
| CIR Manifold #1 Bottle 2.25 L | 67212MFAM70101 | The CIR Manifold #2 Bottle 2.25 L is a 2.25 Liter / 0.59 gallon Pressurized Aluminum Bottle which will be installed within the CIR. This bottle contains 100% Helium pressurized to 12748.4 kPa / 1849 psi at 21.1° C / 69.98° F |
| MDCA Fuel Reservoir | 67235MFAC13500 | The MDCA Fuel Reservoir is a fuel dispensing system installed within the CIR for science operations. The Fuel Reservoir is designed to contain fuel during transport, installation and removal, while allowing precisely controlled dispensing of the desired amount of fuel for each experiment |

TABLE 4.4.1-1 HTV TRANSPORT ITEMS (2 PAGES)

| Part Name | Part Number | Description |
|----------------|----------------|--|
| | | run. The Fuel Reservoir comprises an aluminum housing containing a glass syringe sealed within Tygon Tubing and housed under a transparent Lexan cover. A ground controlled valve attached to the Fuel Reservoir allows the dispensing of fuel but is designed so that it can only be actuated if properly installed within the CIR. |
| MDCA Fiber Kit | 67235MFAL21050 | The MDCA Fiber Kit is an Aluminum Case containing minicell foam which cushions and protects the very fragile MDCA Fibers. Additionally the kit also contains Aluminum Tape Breaker Covers and dry cleaning swabs. |

4.4.2 CIR GAS CHROMATOGRAPH (GC)

4.4.2.1 DESCRIPTION

The CIR GAS CHROMATOGRAPH is shown in figure 4.4.2.1-1 and shown installed in the CIR in figure 4.4.2.1-2. The CIR GC hardware is identified in Table 4.4.2.1-1.

The GC is manifested for flight HTV-3 and will utilize the launch requirements provided in Table 4.2-8, “APPLICABILITY/VERIFICATION MATRIX FOR COMMON LAUNCH VEHICLE REQUIREMENTS BASED ON SSP 57008 REVISION B (PLUS PIRN 57008-NA-0022B) REQUIREMENTS, APPENDIX P,” for certification.

CIR GC Gas Bottles are manifested for flight ULF-5 PMM and will utilize the launch requirements provided in Table 4.2-6, “SSP 57000 Applicability/verification matrix for MPLM-Transported payloads”, for certification.

TABLE 4.4.2.1-1 CIR GC HARDWARE

| PART NAME | PART NUMBER |
|--------------------------------------|----------------|
| Gas Chromatograph ¹ | 67212MFAM30000 |
| CIR GC Helium Bottle ¹ | 67212MFAM70400 |
| CIR GC Argon Bottle ¹ | 67212MFAM70500 |
| CIR GC Check Gas Bottle ¹ | 67212MFAM70600 |

Note 1: These parts are not part of the current verified rack configuration; therefore the rack-level verification requirements in Table 4.2-1 will be addressed for on-orbit certification, prior to integration into the rack.

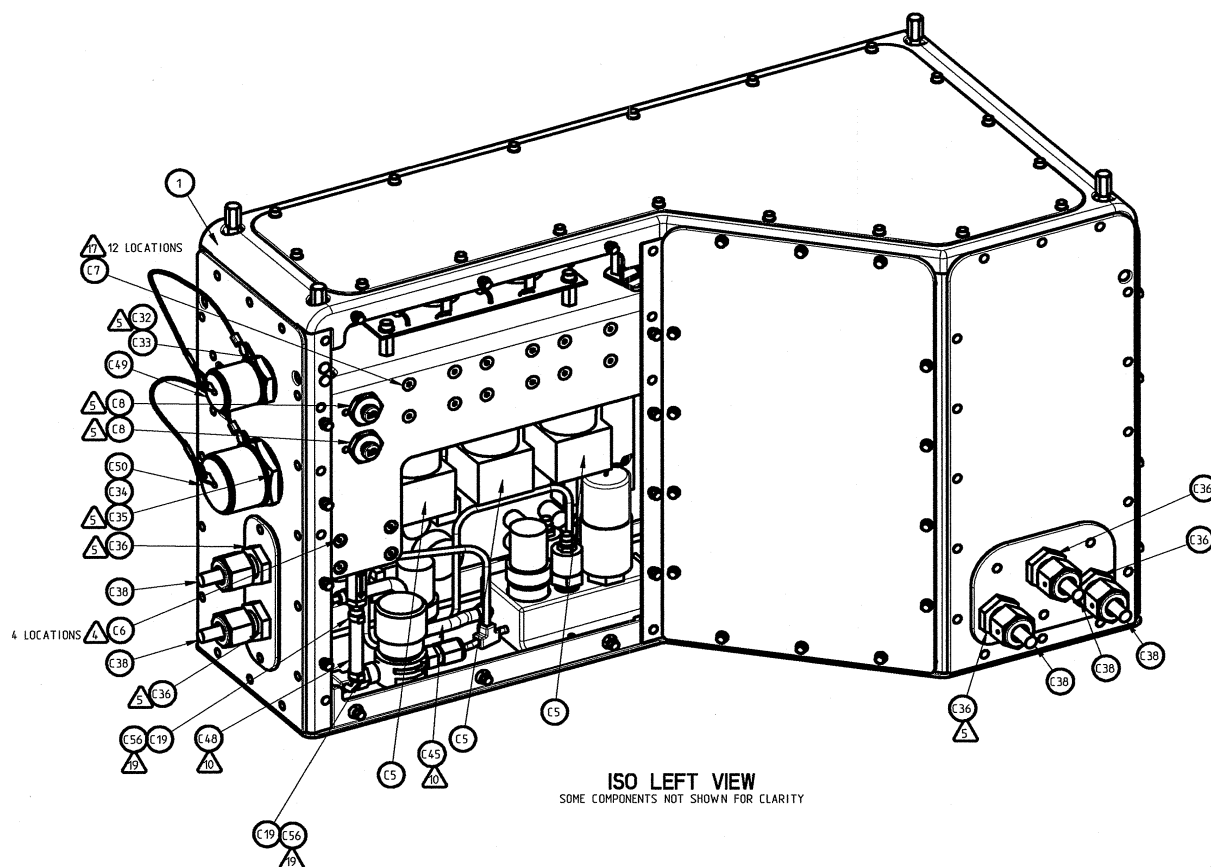


FIGURE 4.4.2.1-1 CIR GAS CHROMATOGRAPH

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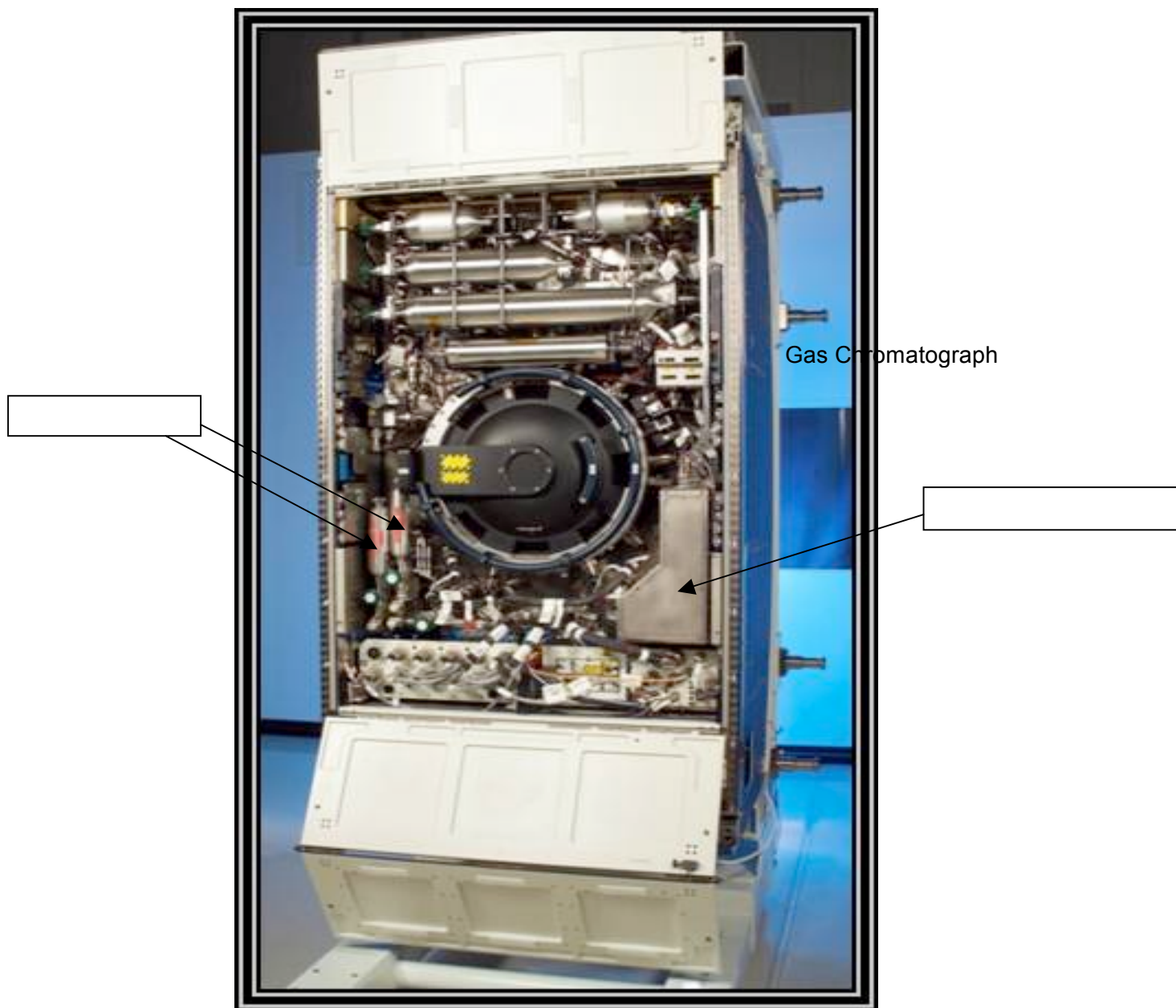


FIGURE 4.4.2.1-2 CIR GC INSTALLED

4.4.3 FLEX-2 EXPERIMENT

4.4.3.1 FLEX-2 DESCRIPTION

The Flame Extinguishment 2 Experiment (FLEX-2) is a new investigation for the CIR utilizing existing CIR and MDCA hardware and software. Its operation and science goals build upon FLEX-1 science but adds many new science objectives. The FLEX-1 Experiment is shown in Figure 4.4.3.1-1.

FLEX-2 will utilize the same CIR & MDCA Hardware as FLEX-1, except that it will add a second CIR HiBMs Imaging Package and an additional FCF Image Processing and Storage Unit (IPSU) to the back of the CIR Optics Bench. FLEX-1 and FLEX-2 are names of science investigations only; there is no hardware containing FLEX or FLEX-2 nomenclature.

FLEX-2 is shown in figure 4.4.3.1-2.

FLEX Layout

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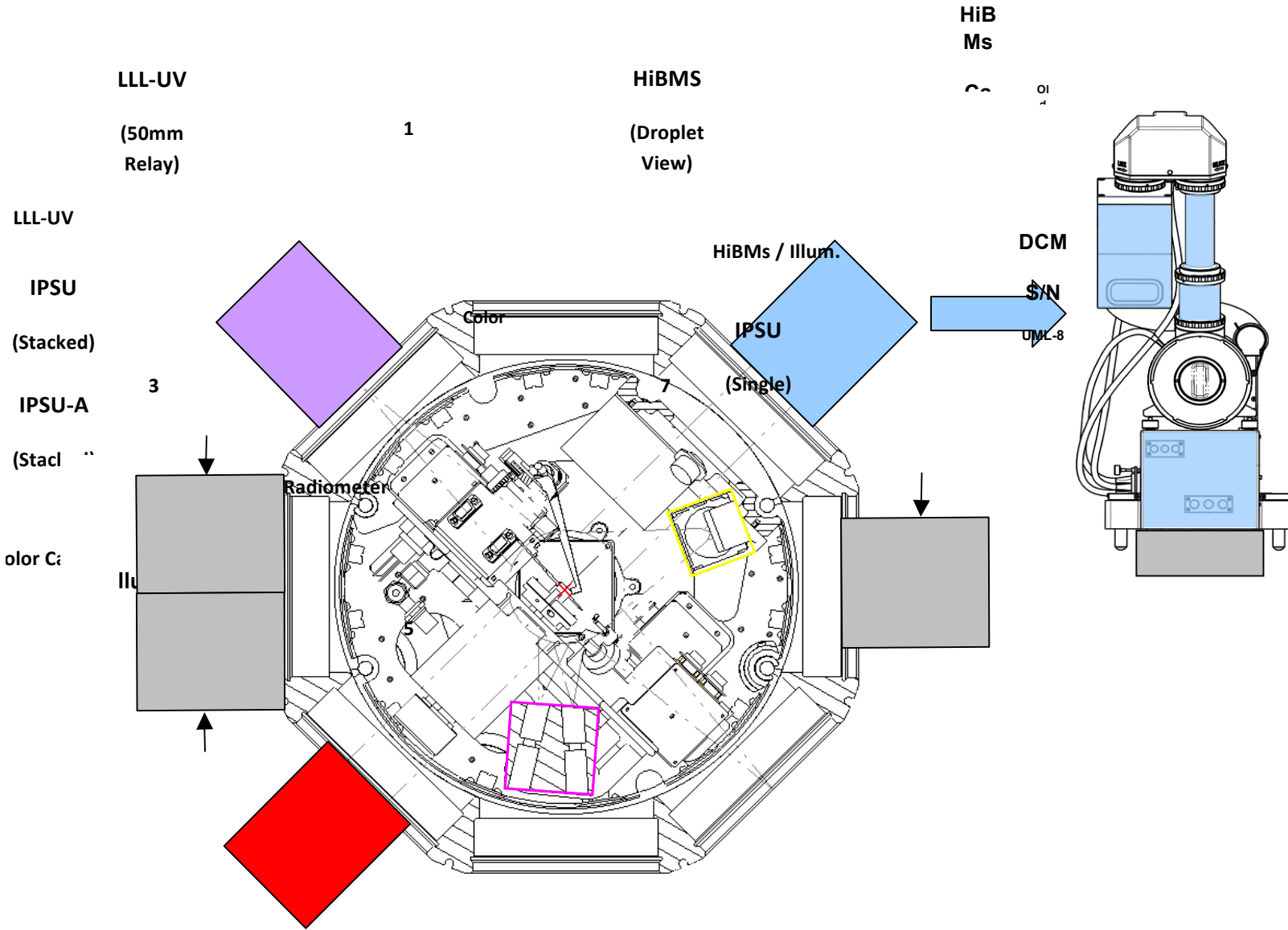


FIGURE 4.4.3.1-1 FLEX EXPERIMENT

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4.4.3.2 FLEX-2 CONFIGURATION

Table 4.4.3.2-1 shows the hardware contained in the FLEX-2 experiment.

TABLE 4.4.3.2-1 FLEX-2 HARDWARE

| | |
|----------------------------|----------------|
| HiBMS Imaging Package | 67212MFAN11000 |
| FCF IPSU | 67211MFAB30100 |
| CIR Illumination Package | 67212MFAN13000 |
| CIR LLL-UV Imaging Package | 67212MFAN14000 |

4.4.3.3 FLEX-2 INTERFACE REQUIREMENTS

Transport requirements must be addressed for the additional hardware components needed to support FLEX-2 operations that are not already on-orbit. Any such hardware items launching within the MPLM will use table 4.2-6 and any items using the middeck will use Table 4.2-5. Transport aboard any other vehicle will use the common launch vehicle matrix in table 4.2-8 for launch certification.

The addition of the FLEX-2 experiment creates a slight configuration change for the CIR. On-Orbit requirements that are affected will be addressed for the CIR Rack configuration of the CIR using the method described in the Subrack Payload Changeout verification method in Table 4.2-1.

5.0 EXCEPTIONS, DEVIATIONS AND WAIVERS

Any exception to requirements, capabilities, or services defined in a Payload IRD and/or interfaces defined in the ICD template must be submitted under specific procedures and guidelines to ensure proper control, evaluation and approval. This section describes the process by which a Payload-proposed non-compliance to an IRD requirement, or to the interfaces defined in this document, is processed and dispositioned. These non-compliances are referred to in this document as *Exceptions*. The specific requirement or interface excepted, along with a description of the existing condition and a rationale for acceptance, will be documented in the unique ICD. Any proposed exception will require preparation of an Exception/PIRN to the payload-unique ICD. This section describes how exceptions are documented. It also describes how the International Space Station Program PIRN Technical Review Panel (PTR) processes exceptions and provides for disposition either directly or through appropriate Program Control Boards.

5.1 DEFINITIONS

5.1.1 EXCEPTION

An exception is the general term used to identify any payload-proposed departure from specified requirements or interfaces. An ISS Program payload exception is a condition of non-compliance with an IRD requirement, an ICD Template interface or with the baselined payload-unique ICD. Based on criteria in Section 5.2, an exception can be approved by the PTR or it may require additional approval by a Control Board.

5.1.2 DELETED

5.1.3 DELETED

5.1.4 DELETED

5.2 EXCEPTION PROCESSING DETAILS

All proposed exceptions to IRD requirements, ICD Template interfaces or to the baselined payload-unique ICD are evaluated by the PTR. The PTR is part of the ISS Program Payloads office. Approval/Disposition signature authority rests with the PTR for those exceptions within their limit of authority. The PTR is authorized to approve exceptions if the following conditions apply:

- Exceptions for which the appropriate vehicle subsystem team has concurred
- No integrated payload allocation/limits have been violated
- No cost impacts

The PCB has authority to approve exceptions that impact the overall payload complement, but do not affect overall ISS requirements.

Exceptions that affect ISS subsystems will require clearance through the Vehicle Systems Integration Panel (VSIP) and then by the Vehicle Control Board (VCB), prior to seeking PTR or PCB approval. Exceptions that affect Partner modules must be approved by both the PCB and the Multilateral Payload Control Board (MPCB).

Evaluation is conducted by reviewers of the appropriate technical or program discipline. Their comments are presented as part of the Exception disposition either to the PTR, the PCB, the VSIP/VCB/PTR/PCB, or the MPCB, according to the criteria discussed above.

In the case of Electromagnetic Interference (EMI) exceptions, the Payload Developer must submit a Tailoring Integration Agreement (TIA) to the Electromagnetic Effects (EME) Panel. The approved TIA, with all the EME Panel analysis, conclusions and recommendations are included as part of the exception processed through PTR.

5.2.1 EXCEPTION LOGGING AND TRACEABILITY

Each payload-unique ICD will identify each exception pertaining to it, and show traceability to its applicable IRD requirement (paragraph). The approved non-compliant condition will be documented in Appendix C of the unique ICD.

5.2.2 EXCEPTIONS TABLE

Each Unique ICD will contain an Exceptions Table that provides the following information concerning each exception. The paragraph number of the IRD requirement being excepted and the corresponding ICD paragraph number will be entered in the first column of the table. Table entries will be sorted according to the IRD paragraph number. IRD paragraph numbers will be listed only once. The exception number will be entered as shown on the exception. Exception numbers will be listed for each applicable IRD paragraph. The exception title will be entered in the table as it is shown on the exception. The approval status will be entered as open, approved, or N/A for the USL, JEM, and Columbus elements of the ISS.

TABLE 5.2.2-1 EXCEPTIONS (3 PAGES)

| IRD/ICD PARAGRAPH NUMBER | EXCEPTION NUMBER 57217-NA | EXCEPTION TITLE | APPROVAL STATUS (USL ONLY) |
|---|--|--|---|
| 3.1.1.3.D | -0010A | CIR Crew Induced Loads Exception | Approved |
| 3.1.1.4.A | 57227-NA-0008 | Rack Shipping Container Heavy Rack Exception | Approved |
| 3.1.1.4.A | -0005C | Exception to CIR Ground Mass Requirement | Approved |
| 3.1.1.4.A | -0002C | Exception to CIR On-Orbit Mass Requirement | Approved |
| 3.1.1.4.A | -0016A | CIR CG Envelope Change Exception | Approved |
| 3.1.1.4.C | -0008C | CIR Modal Frequency | Approved |
| 3.1.1.7.3.A | -0001A | Deviation Approval Request for On- Orbit Temporary Protrusion Exceedance | Approved |

TABLE 5.2.2-1 EXCEPTIONS (3 PAGES)

| IRD/ICD PARAGRAPH NUMBER | EXCEPTION NUMBER 57217-NA | EXCEPTION TITLE | APPROVAL STATUS (USL ONLY) |
|---|--|---|---|
| 3.1.1.7.3.A | -0003A (Superseded by - 0046B) | Exception for CIR Rack Door Protrusion | Approved |
| 3.1.1.7.A | -0029B | Rack-to-Rack Cabling Exception | Approved |
| 3.2.2.8 | -0009 | CIR-EPCU Exception to Large Signal Stability Testing Requirements | Approved |
| 3.2.3.1.C/ 3.2.7 | 57202-NA-0017A | ARIS Wire Rating Exception for All US Lab Rack Locations | Approved |
| 3.2.4.2 | -0012 | FCF Water Flow Control Assemblies Exception to the Bonding Requirements | Approved |
| 3.2.4.4 | -0017A | CIR and FIR EPCU Exception to the EMI CE07 Conducted Emission Requirements | Approved |
| 3.5.1.6.A | -0011 (Supersedes -004A) | CIR Moderate Temperature Loop (MTL) Coolant Return Temperature Exception | Approved |
| 3.5.1.6.B | -0011 (Supersedes -004A) | CIR Moderate Temperature Loop (MTL) Coolant Return Temperature Exception | Approved |
| 3.7.1.4 | 57202-NA-0033B | GN ₂ Umbilical Leakage Exception for Integrated Racks that use ARIS Umbilicals | Approved |
| 3.12.4.3.3.B | -0006A | CIR & FIR Ease of Disconnect (Number of Connector Turns to Disconnect) | Approved |
| 3.12.4.3.6.B | -0007A | CIR MDCA Payload Connector Spacing | Approved |
| 3.2.3.1.C | -0027 | FCF Ground Wire Derating Exception | Approved |
| 3.2.4.6 | -0030 | CIR AC Magnetic Fields Exception | Approved |
| 3.2.4.4 3.2.4.5 | -0031A | Combustion Integrated Rack (CIR) Exception to the EMI CE03 and ESD Requirements | Approved |
| 3.2.4.1 | -0032 | FCF I/O Processor Signal Isolation Exception | Approved |
| 3.1.1.7.1 | -0033 | FCF CIR/FIR On-Orbit Permanent Protrusion Exception | Approved |
| 3.6.1.7.A & B | -0034 | CIR Vented Gases Exception | Approved |
| 3.1.1.1.A | -0035A | FCF CIR/FIR GSE Interface Exception | Approved |
| 3.1.1.3.D | -0036B | FCF CIR/FIR Rack Door Crew Induced Loads Exception | Approved |
| 3.2.4.4 | -0037A | Combustion Integrated Rack Exception to the EMI CS02 and RS03 Requirements | Approved |
| 3.6.3 | -0038 | CIR Vacuum Outgassing Requirements Exception | Approved |

TABLE 5.2.2-1 EXCEPTIONS (3 PAGES)

| IRD/ICD PARAGRAPH NUMBER | EXCEPTION NUMBER 57217-NA | EXCEPTION TITLE | APPROVAL STATUS (USL ONLY) |
|---|--|---|---|
| 3.1.1.4.E | -0039 | FCF CIR and FIR Rack Pivot Mechanism Keepout Zone Exception | Approved |
| 3.12.3.3.1.B | -0040A | CIR Continuous Noise Limits Exception | Approved |
| 3.3.10.2.4 | -0041A | FCF CIR/FIR Fan Ventilation Status Electrical Interface Exception | Approved |
| 3.2.4.3 | -0044 | FCF CIR Exception to the Cable/Wire Design Requirements | Approved |
| 3.2.2.6.2.1.1 | -0045 | EPCU Exception to the RPC Trip Coordination Requirements | Approved |
| 3.1.1.7.3.A | -0046B (Supersedes -0003A) | FCF CIR Door On-Orbit Temporary Protrusion Exception for Stage ULF-2 and Subsequent | Approved |
| 3.2.4.4 | -0053 | FCF CIR FOMA Exception to EMI RE02 Requirements | Approved |
| 3.3.6.1.3.B & C | -0055 | CIR and FIR Exception for Simultaneous use of ISS LANs | Approved |
| SSP 57008 Requirement: N.3.2.11.1 | -0059 | CIR HTV Exception of Fluid Leak Failure Tolerance | Approved |

APPENDIX A
ABBREVIATIONS AND ACRONYMS

| | |
|---------------|---|
| ac | Alternating Current |
| amps | Amperes |
| AMU | Atomic Mass Unit |
| ATCU | Air Thermal Control Unit |
| AUX | Auxiliary |
| C | Centigrade |
| CCT | Cold Cathode Transducer |
| cg | Center of Gravity |
| CIA | Chamber Insert Assembly |
| CIR | Combustion Integrated Rack |
| COC | Certificate of Compliance |
| CR | Change Request |
| dB | decibel |
| dBA | Decibel A-Weighted |
| dBm | decibels Referenced to One Milliwatt |
| dc | Direct Current |
| DDCU | DC to DC Converter Unit |
| ECLS | Environmental Control and Life Support |
| ECS | Environmental Control System |
| EMC CS-01, 02 | Electromagnetic Compatibility; Conducted Susceptibility -01 (CS-01), Conducted Susceptibility -02 (CS-02) |
| EME | Electromagnetic Effects |
| EMI | Electromagnetic Interference |
| EPCU | Electrical Power Control Unit |
| EUE | Experiment Unique Equipment |
| F | Fahrenheit |
| FCF | Fluids and Combustion Facility |
| FCU | FOMA Control Unit |

| | |
|--------|---|
| FDSS | Fire Detection and Suppression System |
| FIR | Fluids Integrated Rack |
| FOMA | Fuel Oxidizer and Management Assembly |
| FRPC | Flexible Remote Power Controller |
| FSS | Fluid System Servicer |
| GIS | Gas Interface System |
| GIU | Ground Integration Unit |
| GRC | Glenn Research Center |
| GSE | Ground Support Equipment |
| HFR/HR | High Frame Rate/High Resolution |
| HiBMS | High Bit Depth/Multi-Spectral |
| HRDL | High Rate Data Link |
| hr | hour |
| Hz | Hertz |
| ICD | Interface Control Document |
| IDD | Interface Design Document |
| IEC | International Electro Technical Commission |
| IOP | Input/Output Processor |
| IPSU | Image Processing and Storage Units |
| IRD | Interface Requirements Document (SSP 57000) |
| ISPR | International Standard Payload Rack |
| ISS | International Space Station |
| ITCS | Internal Thermal Control System |
| JAXA | Japan Aerospace Exploration Agency |
| JEM | Japanese Experiment Module |
| JSC | Johnson Space Center |
| kg | kilograms |
| kHz | kiloHertz |
| kPa | kiloPascal |

| | |
|--------|---|
| KSC | Kennedy Space Center |
| kW | kiloWatt |
| LAN | Local Area Network |
| lbm | pounds mass |
| LED | Light-Emitting Diode |
| LIS | Lead Increment Scientist |
| LLL-UV | Low Light Level Ultraviolet |
| LLL-IR | Low Light Level Infrared |
| LRDL | Low Rate Data Link |
| LTL | Low Temperature Loop |
| mA | milliAmperes |
| MDCA | Multi-User Droplet Combustion Apparatus |
| MDM | Multiplexer-Demultiplexer |
| MOD | Mission Operations Directorate |
| MPCB | Multilateral Payload Control Board |
| MPLM | Multi-Purpose Logistics Module |
| MRDL | Medium Rate Data Link (Ethernet) |
| ms | Millisecond |
| MSD | Microgravity Sciences Division |
| MSFC | Marshall Space Flight Center |
| MTL | Moderate Temperature Loop |
| N/A | Not Applicable |
| NASA | National Aeronautics and Space Administration |
| NGL | Next Generation Laptop |
| NTSC | National Television Systems Committee |
| OOS | Onboard Operations Summary |
| ORU | Orbital Replacement Unit |
| Pa | Pascal |
| PaRIS | Passive Rack Isolation System |

| | |
|-----------|---|
| PCB | Payloads Control Board |
| PD | Payload Developer |
| PEI | Payload Engineering and Integration |
| PFE | Portable Fire Extinguisher |
| PFM | Pulse Frequency Modulation |
| PI | Principal Investigator |
| PIMS | Payload Information Management System |
| PIRN | Preliminary/Proposed Interface Revision Notice |
| PL or P/L | Payload |
| POIC | Payload Operations and Integration Center |
| psia | pounds per square inch absolute |
| psid | pounds per square inch differential |
| PTCS | Payload Test and Checkout System |
| PTR | PIRN Technical Review Panel |
| | |
| RHA | Rack Handling Adapter |
| RID | Rack Insertion Device |
| RPC | Remote Power Controller |
| RPS | Rack Power Switch |
| RSC | Rack Shipping Container |
| | |
| SAMS | Space Acceleration Measurement System |
| SI | International System of Units |
| SPL | Sound Pressure Level |
| S-POCCB | Station Portable Onboard Computer Control Board |
| SSC | Station Support Computer |
| SSCN | Space Station Change Notice |
| SSP | Space Station/Shuttle Program |
| SSPF | Space Station Processing Facility |
| STP | Short-Term Plan |
| | |
| TBD | To Be Determined |
| TBE | Teledyne Brown Engineering |

| | |
|------|------------------------------------|
| TBR | To Be Resolved |
| TIA | Tailoring Interpretation Agreement |
| TSC | Telescience Support Center |
| TSH | Triaxial Sensor Head |
| | |
| UIP | Utility Interface Panel |
| UOP | Utility Outlet Panel |
| USL | United States Laboratory |
| | |
| VCB | Vehicle Control Board |
| Vdc | Volts Direct Current |
| VDS | Verification Data Sheet |
| VES | Vacuum Exhaust System |
| VRS | Vacuum Resource System |
| VSIP | Vehicle Systems Integration Panel |
| | |
| WFCA | Water Flow Control Assembly |
| WFSV | Water Flow Selectability Valve |
| WGS | Waste Gas System |
| WTCS | Water Thermal Control System |

APPENDIX B GLOSSARY OF TERMS

ACCESS PORT

Hole that allows penetration of the Portable Fire Extinguisher nozzle

ACTIVE AIR EXCHANGE:

Forced convection between two volumes. For example, forced convection between a subrack payload and the internal volume of an integrated rack, or forced convection between a subrack payload and the cabin air.

EXCEPTION:

Uniquely defined for Payloads Processes; refer to section 5.1 of this document.

KEEP-ALIVE POWER:

Payload requires power 24 hours per day, 7 day a week, from the time the payload is deployed in the ISS until the time it is removed from the ISS.

Note: All payloads must be able to withstand a no-power condition for short periods to allow physical transfer from shuttle to ISS (when required). Many of these payloads are expected to also require power during ascent and descent (rides up/down) in the shuttle middeck.

NON-NORMAL:

Pertaining to performance of the Electrical Power System outside the nominal design due to ISS system equipment failure, fault clearing, or overload conditions.

OPERATE:

Perform intended design functions given specified conditions.

RACK POWER SWITCH:

The switch that controls power to the rack.

SAFETY-CRITICAL:

Having the potential to be hazardous to the safety of hardware, software, and/or personnel.

APPENDIX C OPEN ITEMS

C.1 PURPOSE AND SCOPE

The purpose of this appendix is to identify the open items from sections 3 and 4 of this document.

C.2 TO BE DETERMINED ITEMS

Table C-1 provides a list of items from section 3.0 that are identified as To Be Determined (TBD). The organization responsible for providing the missing data and the due date for the missing data is also provided.

C.3 TO BE RESOLVED ITEMS

Table C-2 provides a list of items from section 3.0 that are identified as To Be Resolved (TBR) items. The organization responsible for supplying the data is also provided.

TABLE C-1 TO BE DETERMINED ITEMS

| TBD No. | Description | Document Section | Responsible | Due Date |
|----------------|--------------------|-------------------------|--------------------|-----------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

TABLE C-2 TO BE RESOLVED ITEMS

| TBR No. | Description | Document Section | Responsible | Due Date |
|----------------|--------------------|-------------------------|--------------------|-----------------|
| | | | | |

APPENDIX D

REQUIRED SUBMITTAL DATA AND SAMPLE FORMS

The results of verification activities must be documented. All supporting documentation will be retained and provided by the Payload Developer (PD) upon request. Data that are required to be submitted will be identified in table 4.2-1 Applicability/Verification Matrix. Data submittals specified herein do not relieve the PD from reports required to support program and design reviews. The three categories of submittal data are defined below, and Table 4.2-1 will identify which category is acceptable to demonstrate compliance with the verification requirement. The PD is required to indicate on each of the following forms the Stage Effectivity (i.e., 5A.1, 6A, 7A, etc.) for each verification closure submittal.

(1) Certificate of Compliance

A Certificate of Compliance (COC) is a memorandum from a PD certifying that the hardware and/or software comply with the applicable IRD requirement. Multiple IRD requirements may be combined on a single COC. It should also state that the supporting data will be maintained by the PD and provided upon request. A COC can be used to address analysis, test, inspection, and demonstration verification methods. An example follows.

(2) Data Certification

A Data Certification is a memorandum from a PD certifying that the requirements identified in Table 4.2-1 Applicability/Verification Matrix have been met and providing the required summary results. It should also state that the supporting data will be maintained by the PD and provided upon request. The Data Certification will provide the following information:

- Identification of all IRD requirements being addressed by the data certification.
- Statement of fact concerning the completion of the applicable analysis or test.
- Completion date of the analysis or test.
- Identification of the report containing the result of the analysis or test (i.e., Title and Number).
- Summary statement including the results of the analysis or test (e.g., margins of safety summary table or an isolation measurement).

An example follows.

(3) Detailed Data

Detailed analysis and test data per the data required section of Table 4.2-1, Applicability/Verification Matrix. An example follows:

HARDWARE CERTIFICATE OF COMPLIANCE (COC)

I hereby certify compliance with the verification requirements as specified in _____.

I also certify that the identified as-built hardware, per the current applicable Engineering Configuration List, was manufactured in accordance with the design drawings, parts lists, applicable waivers and deviations. All supporting data is valid, applicable, and complete. This data is maintained in our files and will be made available upon request.

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable state in the Stage Effectivity block shown on this form.

| Payload | Stage Effectivity | VDS Number | Method | Applicable Document Rev. Date | Drawings, Parts Lists, Waivers, Deviations, Procedures, Etc. (Attach correlated list as needed) |
|----------------|--------------------------|-------------------|---------------|--------------------------------------|--|
| | | | | | |

Print Name/Signature/Date
Payload Developer Responsible Person

Organization

DATA CERTIFICATION

I hereby certify compliance with the verification requirements as specified in _____.

I also certify that the identified as-built hardware, per the current applicable Engineering Configuration List, was manufactured in accordance with the design drawings, parts lists, applicable waivers and deviations. All supporting data is valid, applicable, and complete. This data is maintained in our files and will be made available upon request.

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable state in the Stage Effectivity block shown on this form.

| Payload | Stage Effectivity | VDS Number | Method | Applicable Document Rev. Date | Summary (attach sheets as needed) |
|---------|-------------------|------------|--------|-------------------------------|-----------------------------------|
| | | | | | |

Print Name/Signature/Date
Payload Developer Responsible Person

Organization

VERIFICATION ANALYSIS REPORT

| Payload: | Stage Effectivity: | Analyst: | Configuration analyzed: | Date: |
|---|---------------------------|-----------------|--------------------------------|--------------|
| 1. Objective of the Analysis: | | | | |
| 2. Requirements Satisfied: | | | | |
| 3. Description of Analytical Technique: | | | | |
| 4. Analysis Input Data (Summary): | | | | |
| 5. Technical Results: | | | | |
| 6. Conclusions: | | | | |
| 7. Signature and Organization: | | | | |

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable stage in the Stage Effectivity block on this form.

VERIFICATION TEST REPORT

| Payload: | Stage Effectivity: | Test Engineer: | Test Procedure Used: | Date: |
|---|---------------------------|-----------------------|-----------------------------|--------------|
| 1. Item Tested (Name, Serial Number, Part Number): | | | | |
| 2. Objectives of the Test: | | | | |
| 3. Description of Test Setup: | | | | |
| 4. Test Results Summary: | | | | |
| 5. Correlation of Test Sequence to Verification Requirements: | | | | |
| 6. Explanation of all Failures and Corrective Action Taken during the Test: | | | | |
| 7. Signature and Organization: | | | 8. Quality Assurance: | |

Note: If the verification data can be used across multiple stages (i.e., 5A.1, 6A, 7A, etc.) then identify each applicable stage in the Stage Effectivity block on this form.